A STUDY OF ETIOLOGICAL AND CLINICAL PROFILE OF ACUTE HEMIPLEGIA IN CHILDREN

Dissertation submitted for
M.D. Degree (Branch VII) Pediatric Medicine
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Chennai, Tamil Nadu

CERTIFICATE

This is to certify that this dissertation titled "A STUDY OF ETIOLOGICAL AND CLINICAL PROFILE OF ACUTE HEMIPLEGIA IN CHILDREN" submitted by Dr. P. SENTHIL KUMAR to the faculty of Pediatric Medicine, The Tamil Nadu Dr. M.G.R. Medical University, Chennai in partial fulfillment of the requirement for the award of MD Degree Branch VII (Pediatric Medicine) is a bonafide research work carried out by him under our direct supervision and guidance.

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DECLARATION

I, Dr. P. SENTHIL KUMAR, *solemnly declare that the dissertation* "A STUDY OF ETIOLOGICAL AND CLINICAL PROFILE OF ACUTE HEMIPLEGIA IN CHILDREN" *has been prepared by me.*

This is submitted to the Tamilnadu Dr. M.G.R. Medical University, Chennai in partial fulfillment of the regulations for the award of MD Degree Branch VII (Pediatric Medicine)

Place : Madurai

Date : Dr. P. SENTHIL KUMAR

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I would grossly fail in my duty if I fail to mention here of my patients without whom this study was not possible.

CONTENTS

INTRODUCTION

The term ‘HEMIPLEGIA’ denotes paralysis of one side of the body[1]. It is one of the most important causes of morbidity & mortality in children. Hence it has to be identified earlier & managed appropriately to prevent not only economic burden but also to get a social stigma.

The clinical presentation of hemiplegia depends on the age of the patient, duration of the underlying pathology and the area of the central nervous system affected[2]. The onset of hemiplegia may be acute or may evolve over a period of weeks or months. All pediatric age groups can be affected.

The term Acute Hemiplegia means paralysis of one side of the body, which develops within a few hours[3]. The etiology of acute hemiplegia ranges from cerebrovascular events to trauma and tumor.

Interethnic differences have been demonstrated to be important in acute hemiplegia in children notably in pediatric Stroke, which is the most important cause of acute hemiplegia in children. However most studies on acute hemiplegic in children were from Europe or America and there is a lack of adequate data on acute hemiplegia in children among Asian children.

Hence, our study aims to identify the various etiologies & clinical presentation of acute hemiplegia in children in our setup.

ACUTE HEMIPLEGIA

The term acute hemiplegia denotes paralysis of one side of the body which develops within a few hours and lasting for more than 24 hours. Even though plegia denotes complete paralysis and Paresis denotes lesser degree of weakness, in daily clinical parlance the word paralysis is often used for both complete and partial loss of motor function[1].

CLINICAL- ANATOMIC CORRELATIONS

Hemiplegia can result from a lesion in several central nervous system locations. Those include the posterior portion of the frontal lobes of the cerebral cortex and its underlying subcortical white matter, the internal capsule, the ventral portion of the brain stem and the dorsolateral portion of the upper spinal cord. Since the pyramidal tract decussates in the medulla, lesions in the cerebral cortex & brain stem above the medulla affect the contralateral limbs, whereas lesions of the medulla and upper spinal cord affect ipsilateral limbs[4].

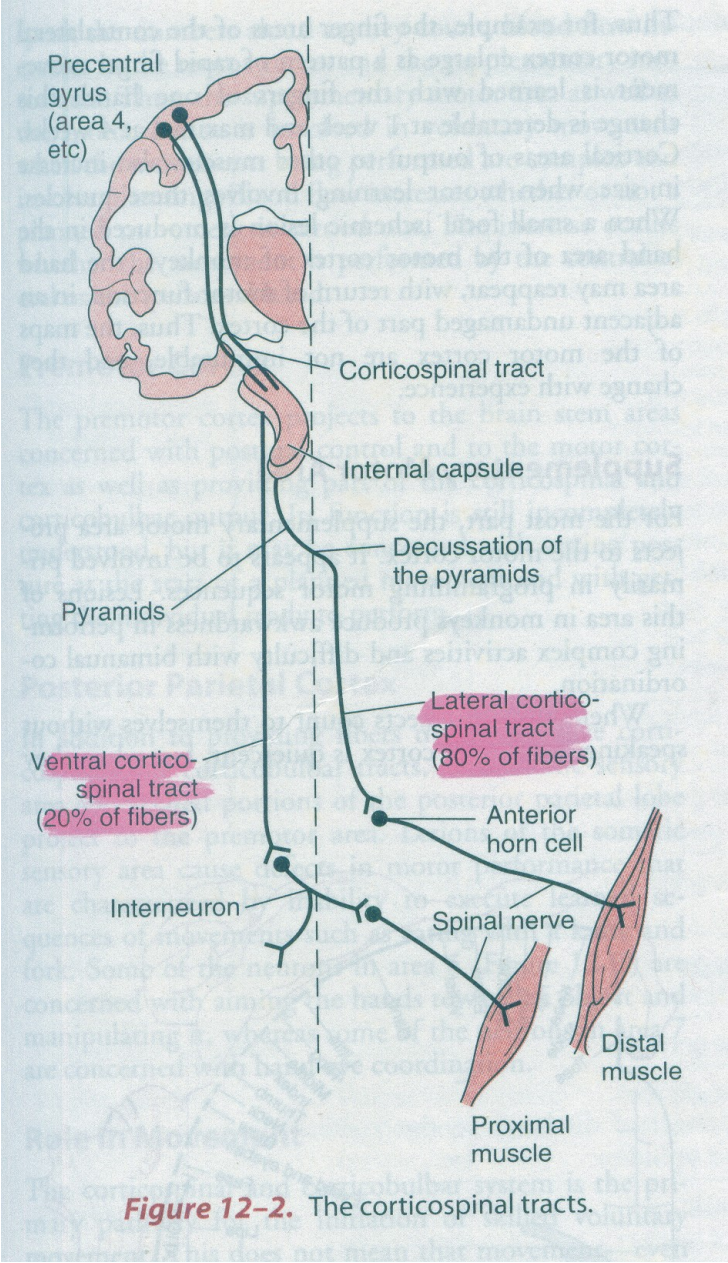


Figure 12–2. The corticospinal tracts.

FIGURE - 1

CORTICO SPINAL TRACT

A lesion in the cerebral cortex of the posterior portion of the frontal lobe and its underlying white matter produces predominantly upper or lower extremity

hemiparesis depending on the area involved. Patients with lesions in the lateral surface have contralateral weakness involving the arm and the lower quadrant of the face. Patients with lesions on the mesial surface have contralateral weakness involving the leg. Lesions in the internal capsule produce contralateral hemiplegia with equal involvement of the arm and leg due to the close proximity of the fibers to the arm and leg at the level of the internal capsule. Lesions in the medulla & spinal cord produce ipsilateral hemiplegia.

The presence or absence of associated findings is crucial in establishing the location of the lesion. Abnormalities of mental function are often present in lesions of the cerebral hemispheres, but are characteristically spared in lesions of the internal capsule or below[2].

In lesions of the dominant hemisphere usually the left, deficits in language are common, lesions of the non dominant hemisphere often results in disorders of spatial relationships. In the young child, language function may be spared or reversible in lesions in the dominant hemisphere, but under such circumstances, deficits in spatial relationships frequently ensue[2].

Cranial nerve paralysis also helps in localizing the site of lesion.

Mid brain - III & IV Nerve

Medulla - IX, X, XI, XII Nerve

UMN VII Nerve Paralysis in the same side of hemiplegia indicates that

the lesion is above the pons (opposite-side)

LMN VII Nerve Paralysis with contralateral hemiplegia inditicates lesion at pons on the side of VII Nerve palsy.

CAUSES OF ACUTE HEMIPLEGIA[5,3]

1. Cerebro Vascular disease (stroke)
2. Trauma
3. Space occupying lesions e.g.: tumor / cerebral abscess / neurocysticercosis
4. Epilepsy
5. Hemiplegic migraine[3]
6. Alternating Hemiplegia of childhood[3]
7. Asthmatic amyotrophy (Hopkins Syndrome) [3]
8. Kawasaki disease[6,3]
9. Mitochondrial encephalopathy, Lactic Acidosis & Stroke (MELAS)

CAUSES OF STROKE IN CHILDREN[7,8,9,2,3]

(i) CEREBROVASCULAR MALFORMATIONS

- arteriovenous malformations
- Fibromuscular dysplasia
- Hereditary hemorrhagic telangiectasias.

- Sturge Weber syndrome
- Intra cranial aneurysm

2) TRAUMA

- Arterial dissection
- Blunt trauma to neck
- Intra oral trauma
- Vertebral manipulation

3) HEMATOLOGIC DISORDERS

- Sickle cell anemia/disease
- Thrombocytopenic Purpura
- Protein C/S deficiency
- Antithrombin - III deficiency

- Factor V (Leiden) Mutation
- DIC
- Malignancy
- Antiphospholipid antibodies / Lupus anticoagulant
- Drug induced thrombosis.

4) CARDIAC DISORDERS

- Congenital heart disease
- Arrhythmia
- Atrial myxoma
- Bacterial endocarditis
- Cardiomyopathy
- Cardiac Catheterization
- Mitral Valve Prolapse
- Rheumatic Heart disease
- Prosthetic heart Valve
- Rhabdomyoma

5) VASCULITIS / VASCULOPATHIES

A) INFECTIONS

- Pyogenic Meningitis
- Tuberculous meningitis
- Viral Meningo encephalitis - Varicella , Coxsackie
- HIV

- Fungal meningitis

B) CONNECTIVE TISSUE DISORDERS

- Systemic lupus erythematosus
- Mixed connective tissue disease
- Takayasu arteritis
- Isolated angitis
- Hypersensitivity Vasculitis
- Polyarteritis Nodosa

C) OTHERS : -

- Moya Moya disease / Syndrome
- Drug abuse - Cocaine / Amphetamine
- Hemolytic Uremic Syndrome

6) METABOLIC

- Homocystinuria
- Sulfite Oxidase - deficiency
- Fabry's Syndrome
- Organic Acidemia

CLINICAL PRESENTATION[3]

The clinical presentation of acute hemiplegia depends on the etiologies and age of the patient and site of lesion.

The Infants & children who have acute hemiplegia can be divided almost equally into two groups according to whether or not the hemiplegia was preceded by epilepsia partialis continua. Both the groups may have seizures on the paretic side after hemiplegia is established. Cerebral infarction usually in the distribution of middle cerebral artery accounts for one fourth of the cases in which seizures precede hemiplegia & more than half of the cases in which hemiplegia is the initial feature.

Whatever the cause, the probability of a permanent motor deficit is almost 100% when the initial feature is epilepsia partialis continua & about 50% when it is not.

STROKE

In case of stroke, the hemiplegia is maximal at onset and there is usually more severe involvement of the upper extremity and face. Recovery in the lower extremity precedes and exceeds that in the upper extremity[10].

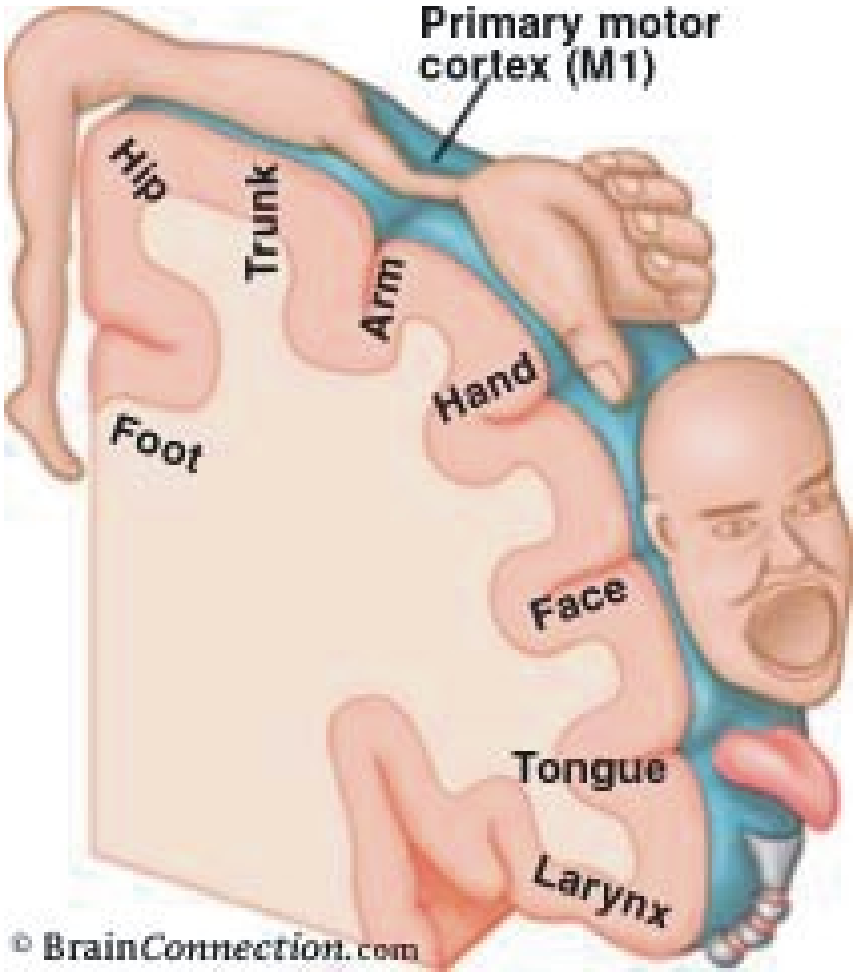


FIGURE - 2

MOTOR HOMONCULUS

Sensory impairment is the result of parietal lobe involvement. Superficial modalities are usually intact. In the older child, Stereognosis, position Sensation and two point discrimination are often impaired and this commonly correlates with

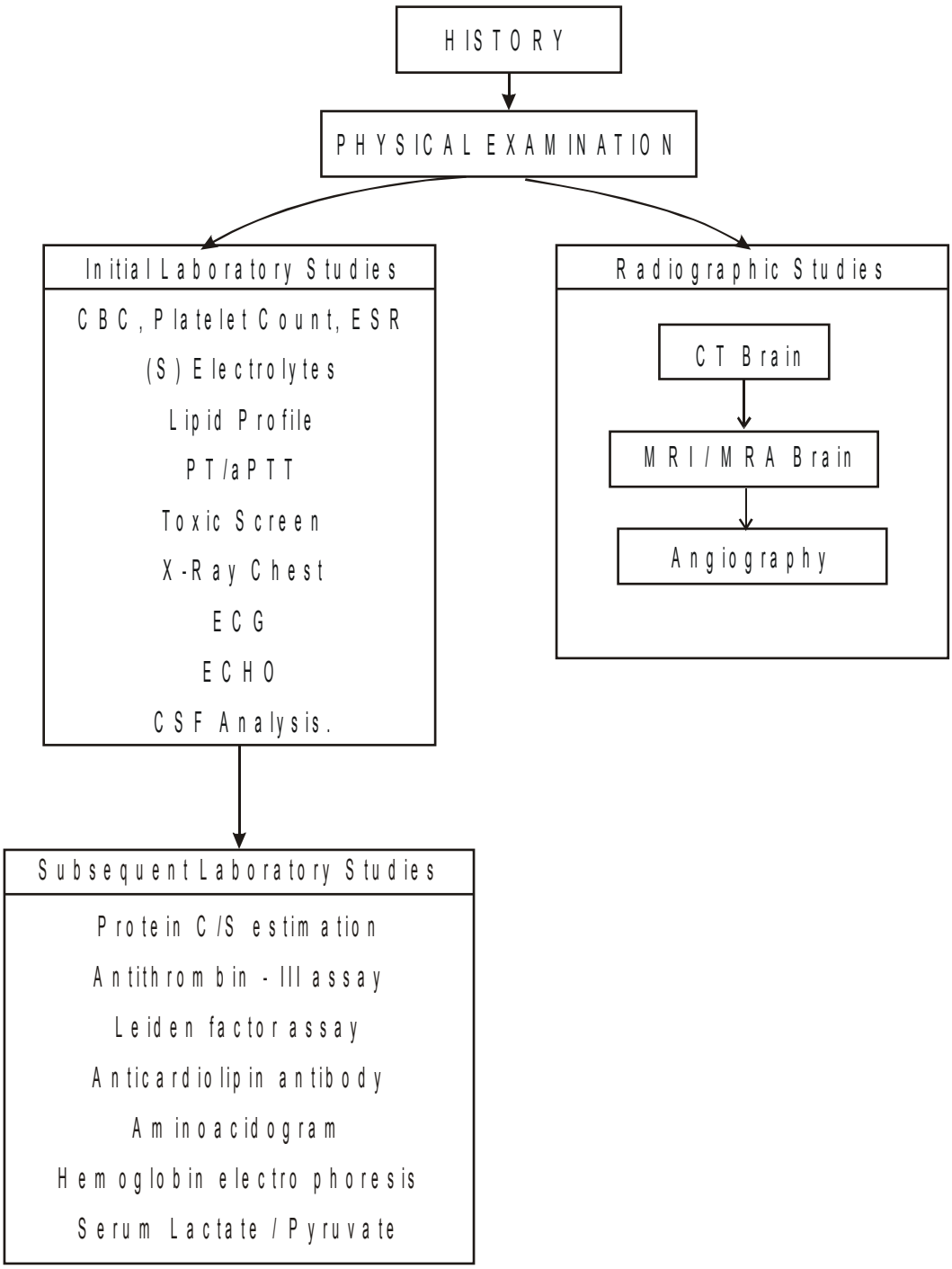
coexisting hemiatrophy[11].

Eye defects are relatively common and include homonymous hemianopia to the side of hemiplegia. Speech defects and retardation of speech developments are primarily dependent upon the age of the child at the onset of hemiplegia. Dysphasia more commonly encountered in older children with a dominant hemisphere lesion and is rare in children younger than 4 yrs of age[10], unless associated with mental retardation, it is never observed with onset before the age of 2 yrs.

APPROACH TO THE PATIENT

The purpose of the diagnostic evaluation is to establish the presence and location of the lesion, to identify the cause and to determine if predisposing factors are present. In many instances, the cause is readily apparent from the history, physical examination and routine laboratory studies. For example hemiplegia in a child with Sickle cell disease, cyanotic heart disease or intra oral trauma. In others, extensive laboratory investigations are necessary. Neuro radiologic and other laboratory evaluations should be conducted simultaneously.

APPROACH


HISTORY
PHYSICAL EXAMINATION
Initial Laboratory Studies
CBC, Platelet Count, ESR
(S) Electrolytes
Lipid Profile
PT/aPTT
Toxic Screen
X-Ray Chest
ECG
ECHO
CSF Analysis.
Radiographic Studies
CT Brain
MRI/MRA Brain
Angiography
Subsequent Laboratory Studies
Protein C/S estimation
Antithrombin - III assay
Leiden factor assay
Anticardiolipin antibody
Aminoacidogram
Hemoglobin electro phoresis
Serum Lactate / Pyruvate

CT Brain is the initial radiological procedure of choice since it can be done rapidly and will determine if haemorrhage is present. In the absence of intracranial haemorrhage and trauma, head MRI especially when coupled with recently developed diffusion weighted techniques, will provide structural detail of infarctions and is the investigation of choice for stroke. MRA provides excellent visualizations of Vascular tree[2].

If the initial biochemical and Radiological investigations failed to disclose an etiology, further laboratory tests like protein C/S, Anti Thrombin- III are necessary.

TREATMENT

ACUTE MANAGEMENT

In acute stage, maintaining perfusion & homeostasis is the first priority. Signs of Trauma and raised ICT should be looked for and treated[12].

SPECIFIC MANAGEMENT

Depends on the underlying cause[12]

STROKE

Literature review reveals that there is no randomized clinical trial regarding the treatment of stroke in children. Current treatment recommendations are based on therapies proven in adult stroke patients with biological plausibilities and Safety data in pediatric Patients[13,14,15].

* Use of anticoagulant therapy - in pediatric Arterial ischemic Stroke, Heparin - ideally Low Molecular weight heparin can be used.

* Aspirin is used in children in the prevention of recurrence after TIA or ischemic Stroke.

* Warfarin may be used in stroke due to acquired or congenital heart disease, Hypercoagulable States and dural sinus thrombosis.

* Thrombolytic agents are highly controversial in children with stroke.

REVIEW OF LITERATURE

HISTORICAL ASPECTS[1] :

The key factor in Acute Hemiplegia is Localization which was first recorded in an Egyptian papyrus from the age of pyramids (3000-2500BC) about aphasia. An Egyptian surgeon wrote, “If thou examinest a man having a wound in his temple, penetrating to the bone (and) perforating his temporal bone..... If thou ask of him concerning his malady and he speak not to thee while copious tears fall from both his eyes, so that he thrust his hand often to his face so that he may wipe both his eyes with the back of his hands.....”

Edwin Smith surgical papyrus

Case 20, (2800 BC)

From the time of Hippocrates, it was documented that injury to the left part of brain results in weakness of the right side of the body[1].

The syndrome of acute Hemiplegia was first described in 19th century by Freud. It was often described often under the term Marie Strumpell encephalitis a nomenclature designed to stress its supposed relationship to polio encephalitis[10].

Freud wrote as “A child who has hitherto been well without hereditary predisposition is suddenly taken ill at an age between a few months to 3 yrs. The etiology of the disease either remains unexplained or is attributed to a concurrent infection. The presenting symptom may be either stormy with fever, convulsions and vomiting or insignificant.....

A hemiparesis may appear at this point or not until later. It spreads in the usual manner first face then arm then leg. At first it is a flaccid paralysis; but very soon it becomes spastic with increased reflexes and contractures....[16]"

Although Freud considered children who develop acute Hemiplegia as having been "hitherto well" this actually is not the case. Some of the children with acute hemiplegia may have underlying predisposing factors like congenital Heart Disease, Hemoglobinopathies and metabolic defects etc.

Ford recalled observing some 200 patients with this condition at the Harriet lane home in Baltimore[16,17,18].

The study of acute Hemiplegia in childhood in the pre CT scan era by Isler (1971) from Zurich surveyed the clinical and radiological data on 116 cases assigning them to many etiopathogenic groups. Vascular causes (50%)

were predominant in their series. They may have operated in some cases of encephalitis and other cerebral disease.

Later in 1976 Gold & Carter et al found that around 30% of children with acute Hemiplegia had no etiology. They observed 86 patients by a 21 year study. In their study, Trauma (13%) and infection (13%) were the next to Idiopathic group[19].

Chou YH, Wong PJ et al observed 57 patients from 1982 to 1991 in the Department of Pediatrics, National Taiwan University hospital. They found that

cerebrovascular accidents (Stroke) were the commonest cause (66.7%) of acute Hemiplegia in children followed by tumors and trauma[20].

Estimates of Incidence of all pediatric stroke ranged from 2.5 to 13 cases per 100,000 children per year[21] (Giroud et al 1995) with some variation among studies on the inclusion of neonates , traumatic strokes and meningitis and whether to use 16 or 18 as cut off for pediatric stroke. There is also variation among studies as to whether hemorrhage and ischemia predominate. Estimates of rate of hemorrhagic stroke have varied between 1.2 and 5 per 100,000 children per year [2](Giroud et al 1995) and estimates of rates of ischemic stroke have varied between 0.6 and 8 per 100,000 children per year[21,22,23] (Giroud et al 1995, De Veber et al 2002)

According to Veena Kalra et al, the incidence of stroke in 0-14 year age group (excluding the stroke related to birth, intracranial infections and trauma) is 2.52/100,000 children / per year[24].

According to Chung B, Wong V; Division of neuro developmental pediatrics, University of Hong Kong, the estimated incidence of pediatric stroke between 1998 & 2001 was 2.1 cases / 100,000 children per year[25].

According John. H. Menkes et al, 55% of 69 children with stroke in his study under 15 years had ischemic stroke[26,16].

Giroud et al analyzed 54 stroke patients under 16 years of age of which 57%

were ischemic and 43% were hemorrhagic strokes[21].

A retrospective analysis of (1991-2000) of 100 acute stroke cases at All India Institute of Medical Sciences (AIIMS) revealed ischemic stroke as the most common cause of stroke[27].

Chung B and Wong V from the Division of Neuro developmental pediatrics, University at Hong Kong analyzed the details of stroke patients from 1998 to 2001 by gathering the data from clinical data analysis and reporting system of Hong Kong public Hospitals. They have found that ischemic stroke (72%) is more common than Hemorrhagic stroke[25].

The etiology of ischemic stroke is changing from idiopathic to specific etiology due to the improvement in the radiological and laboratory investigations.

Gold and Carter et al in 1978 found that Idiopathic was the most common cause of ischemic stroke[28]. Fritsch et al in 1984 found that 8/19 children with ischemic stroke had no etiology[29].

An MRA study of 24 Stroke patients by Wiznitzer and Masaryk in 1991 shower Arterial stenosis in 18 cases, embolism in 3 cases, meningitis in 1 case and Crohns disease related vasculitis in 1 case[30].

But a retrospective analysis of 100 acute stroke children (1991-2000) by Veena Kalra et al in AIIMS Delhi showed neuro infections as the most common etiology of stroke in children[27].

Giroud et al analysed 54 stroke patients under 16 years. He found that neuro infections and trauma are equally important in causing ischemic stroke[21].

Recently Tahir Saeed Siddiqui et al from Department of pediatrics and medicine, Ayub medical college, Pakistan (2002-2005) found that neuro infection were the commonest cause of stroke. They also found that encephalitis was more common than pyogenic and TB meningitis[31].

But according to Colin D. Rudolph," the most common cause of CNS vasculitis is bacterial meningitis.Cerebral infarction is found in 12-27% of children with bacterial meningitis[32]."

Congenital Heart disease is also an important cause of stroke in children and is most likely in children with cyanotic disorders[33,34].

Tyler and Clark found that cerebro vascular accidents occur in patients of congenial cyanotic Heart disease, when there is low arterial O_2 content or a red blood cell count above 8 million[35].

Iron deficiency also contributes to stroke in cyanotic Heart disease patients.

LinderCamp et al. found that hemoglobin concentration of more than 20 gm % was associated with increased risk of thrombo embolic episodes[36].

Among the Vasculopathies, Moya Moya is a frequent cause of pediatric

stroke in India. This disorder is worldwide in distribution with a female to male bias of 3:2[3]

Nagaraja et al in a study of non haemorrhagic stroke in patients aged from 1-16 years detected no cause in 23, Moya Moya 6 and arteritis in 5 [37,38].

Stroke has been reported in HIV infected children. According to Brady & Draft, “Cerebro Vascular Accidents can occur in HIV infected child especially when the child has HIV related thrombocytopenia[12].

Patients with AIDS may also develop arteriopathy of Medium and small vessels or aneurysms and although the presumed cause for most cases is direct or secondary infection, the exact pathophysiology is not always clear[12].”

Park et al (1990) found that 4 out of 68 children with AIDS followed over 4.5 years had clinical or neurological evidence of stroke[39].

Trauma to carotid artery resulting in dissection and thrombosis may result from child abuse, during exercise and sports (Patel et al 1995) [40], tonsillectomy and falling with a blunt object in the mouth.The onset of symptoms is usually delayed for several hours and sometimes days[3].

Among space occupying lesions, Tumors, Brain abscess,Neuro cysticercosis can cause acute hemiplegia. Incidence of brain abscess in cyanotic heart disease is 2-3%. According to Oski, “Neurocysticercosis can cause seizures (most common), Headache, altered sensorium, visual problem, focal deficits and hydrocephalus[41].”

According to Kenneth F. Swaiman, “Stroke in childhood has a number of different clinical presentations that vary with the patient’s age (Lanka et al 1991). Infants most frequently present with seizures; motor signs are few until the child begin to develop skilled motor acts, older children present with sudden onset of hemiparesis with or without seizures[42].

Chou YH and Wang PJ et al (from 1982 to 1991) observed 57 patients of Acute Hemiplegia aged upto 18 years. They found that besides hemiplegia, cranial nerve palsy was present in 47% of patients, altered sensorium - 42% , Headache 42%, seizures - 21% and fever 21%[20].

Fritsch-G et al (1984) in their study found that altered sensorium in 58%, facial palsy in 63% and Aphasia and seizures in 32%[29].

Mortality after stroke in children ranges from 20% to 30% depending on the location and the underlying cause. Hemorrhagic stroke has a higher mortality than ischemic stroke. The prognosis is poor for infants and whose initial features are seizures with hemiplegia[43,44,45,24].

Chou YH & Wang PJ reported 21% mortality in their study of 57 patients with acute Hemiplegia[20].

Retrospective study by Chung and Wang et al reported 18% mortality in 50 children with stroke[27].

AIMS & OBJECTIVES

(i) To know the Etiological profile of Acute Hemiplegia in children of 1 month - 12 years.

(ii) To study the various clinical presentation of Acute Hemiplegia in children of the above mentioned age group.

(ii) To study the outcome in the above cases.

MATERIALS & METHODS

Definition of Variables:

Acute Hemiplegia: Acute Hemiplegia means paralysis of one side of body which develops within a few hours and lasting for > 24hrs.

Subjects:

All Children admitted in our Institute with the above mentioned definition in the age group of 1 month - 12 yrs formed the study group.

Study design

Prospective observational study

Place

Institute of child health & Research centre

Govt. Rajaji Hospital, Madurai.

Period of Study

August 2004 to July 2006.

Inclusion criteria

(i) Age : 1 month - 12yrs.

(ii) Unilateral Weakness of acute onset (within few hrs)

(iii) Unilateral Weakness lasting for more than 24 hrs.

Exclusion Criteria:

(i) Age < 1 month and > 12 yrs.

(ii) Weakness of insidious onset.

(iii) Weakness lasting < 24 hrs.

Sampling technique:

All patients of acute Hemiplegia with the above mentioned criteria were included without any randomization.

METHODOLOGY

At the time of admission, the clinical presentation is noted by detailed history and physical examination which were entered in a pretested proforma.

The study population is evaluated by various laboratory tests and Imaging methods.

Diagnosis of stroke was made by identifying an infarct in a particular vascular territory [corresponding to the clinical findings] by MRI/MRA. The cause for stroke is further evaluated by appropriate laboratory investigations and clinical procedures.

If neuro infections are suspected, lumbar puncture was done after informed consent. Cerebro spiral fluid were sent for cell count, culture and sensitivity, biochemical analysis for glucose, protein, chloride & globulin and AFB & Gram staining.

All the suspected or previously diagnosed cases of Heart disease were evaluated with chest X-Ray, Electro cardiogram and Echo.

Antinuclear antibody & preliminary metabolic work up like urine metabolic screening & Blood Sugar and plasma Lipid profile were done in all cases.

Preliminary coagulation profile, clotting time, Bleeding time, Prothrombin time, activated partial thromboplastin time and complete Hemogram were done in all cases.

A diagnosis of Idiopathic was made when no conclusive evidence for etiology of stroke with the available investigations were obtained.

All the patients were analyzed for outcome in the form of death or survival. All the survived cases were followed up for about 3 months for the persistence of Residual paralysis and recurrence of acute Hemiplegia.

All the data were entered in a pretested proforma and was studied regarding the etiological profile, clinical presentation &and outcome.

OUTCOME OF THE STUDY:

Outcome of the study is measured in the form of

(i) Etiological profile

(ii) Clinical Presentation

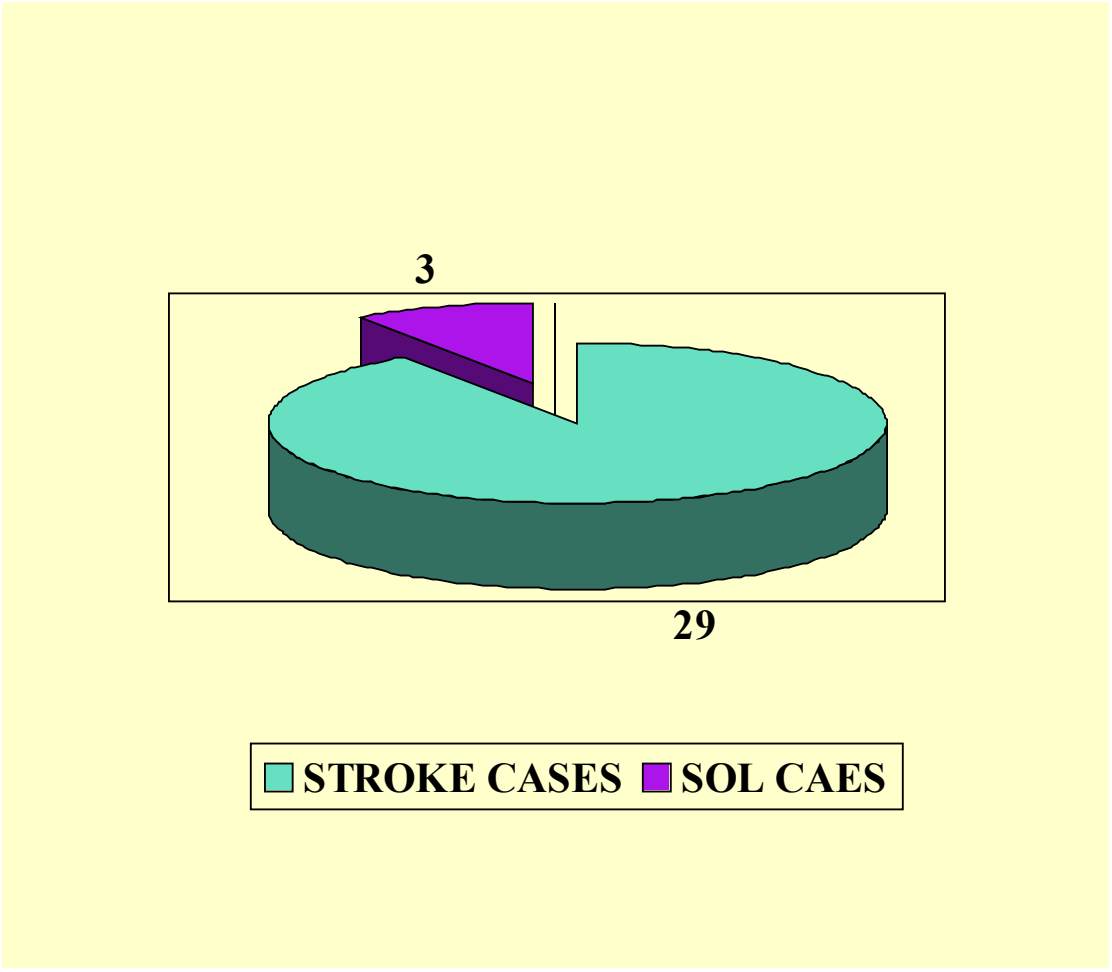
(iii) Outcome.

ETHICS:

(i) Informed consent is obtained from parents before the study.

(ii) Ethical clearance is obtained from the ethic committee of the Institution and University through proper channel.

ETIOLOGICAL PROFILE OF ACUTE HEMIPLEGIA IN CHILDREN



RESULTS

TOTAL NUMBER OF CASES : 32

ETIOLOGICAL PROFILE

The two etiologies of acute hemiplegia in children in our study were stroke & Space occupying lesions.

1. STROKE : 29 (90.6 %)

2. SPACE OCCUPYING LESION : 3 (9.4 %)

1. STROKE :

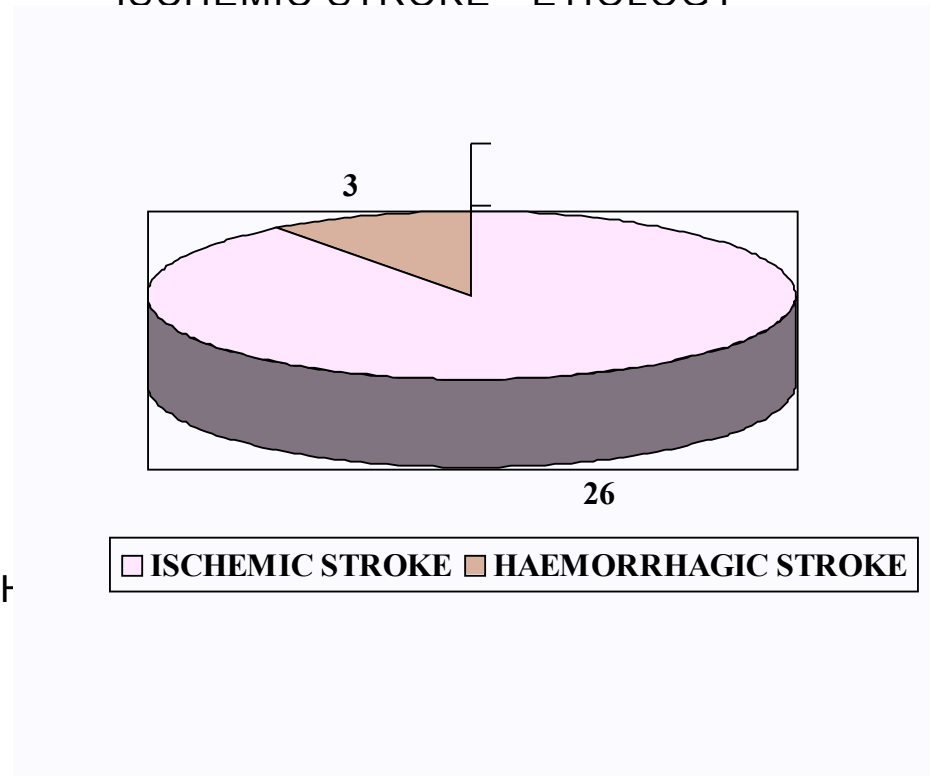
Stroke can be divided into ischemic and hemorrhagic stroke.

Table No. : 1

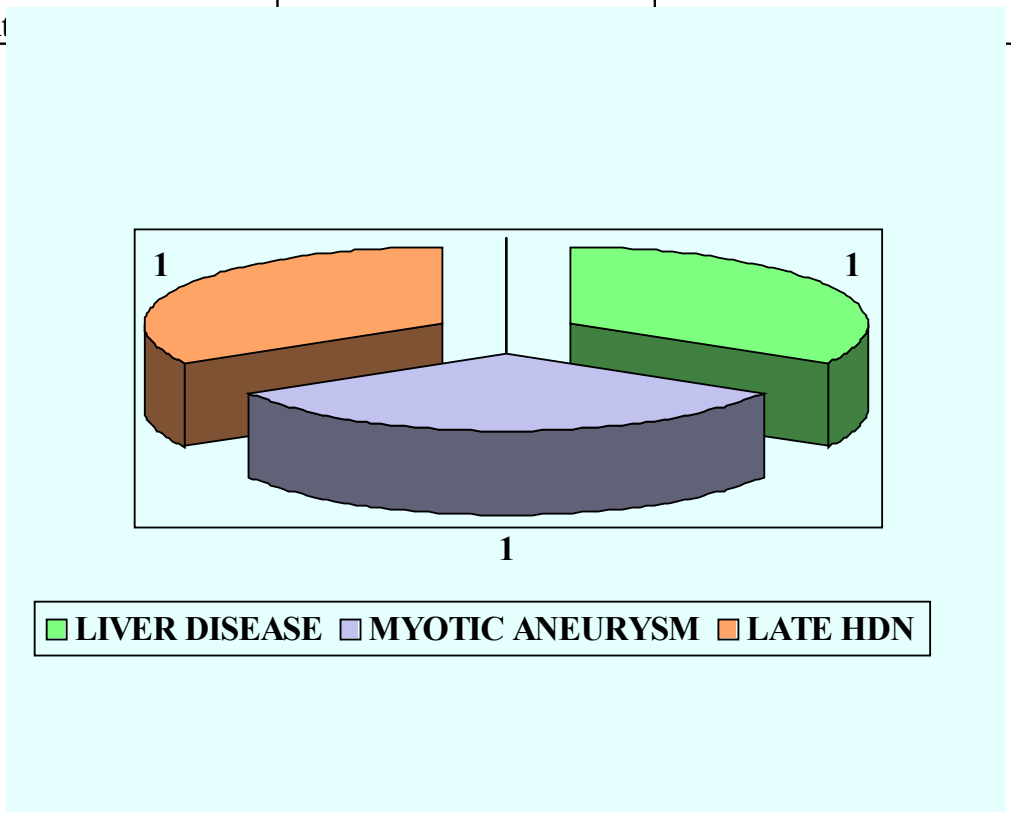
STROKE

	Ischemic stroke	Haemorrhagic Stroke

ISCHEMIC STROKE - ETIOLOGY



Total No. of cases	26	3
Percent		



(A) ISCHEMIC STROKE : 26 (89.7%)

TABLE 2 ETIOLOGY OF ISCHEMIC STROKE (26 CASES)

S.NO	ETIOLOGY	NO OF CASES	PERCENTAGE
1.	INFECTIVE VASCULITIS	11	42.3
2	IDIOPATHIC	7	26.9
3	CONGENITAL HEART DISEASE WITH THROMBOEMBOLISM	4	15.4
4	MOYA MOYA	2	7.7
5	DILATED CARDIO MYOPATHY WITH LA CLOT	1	3.8
6	CAROTID DISSECTION	1	3.8

About 42.3% of ischemia were due to infective vasculitis. 26.9% of ischemic stroke patients had no etiology. Congenital Heart disease accounted for 15.4%, Dilated cardiomyopathy 3.9% and Moya Moya 7.7%.

TABLE 3 ETIOLOGY OF INFECTIVE VASCULITIS (11 CASES)

S. No.	ETIOLOGY	No. OF CASES	PERCENTAGE
1	VIRAL MENINGO ENCEPHALITIS	6	54.5
2	TUBERCULOUS MENINGITIS	2	18.2
3	PYOGENIC MENINGITIS	2	18.2

4	HIV ASSOCIATED OPPORTUNISTIC INFECTION	1	9.1

Viral meningoencephalitis accounted for about 54.5% of infective vasculitis cases causing stroke. Next were Tuberculous meningitis (18.2%), Pyogenic meningitis (18.2%) & HIV associated opportunistic infection (one case).

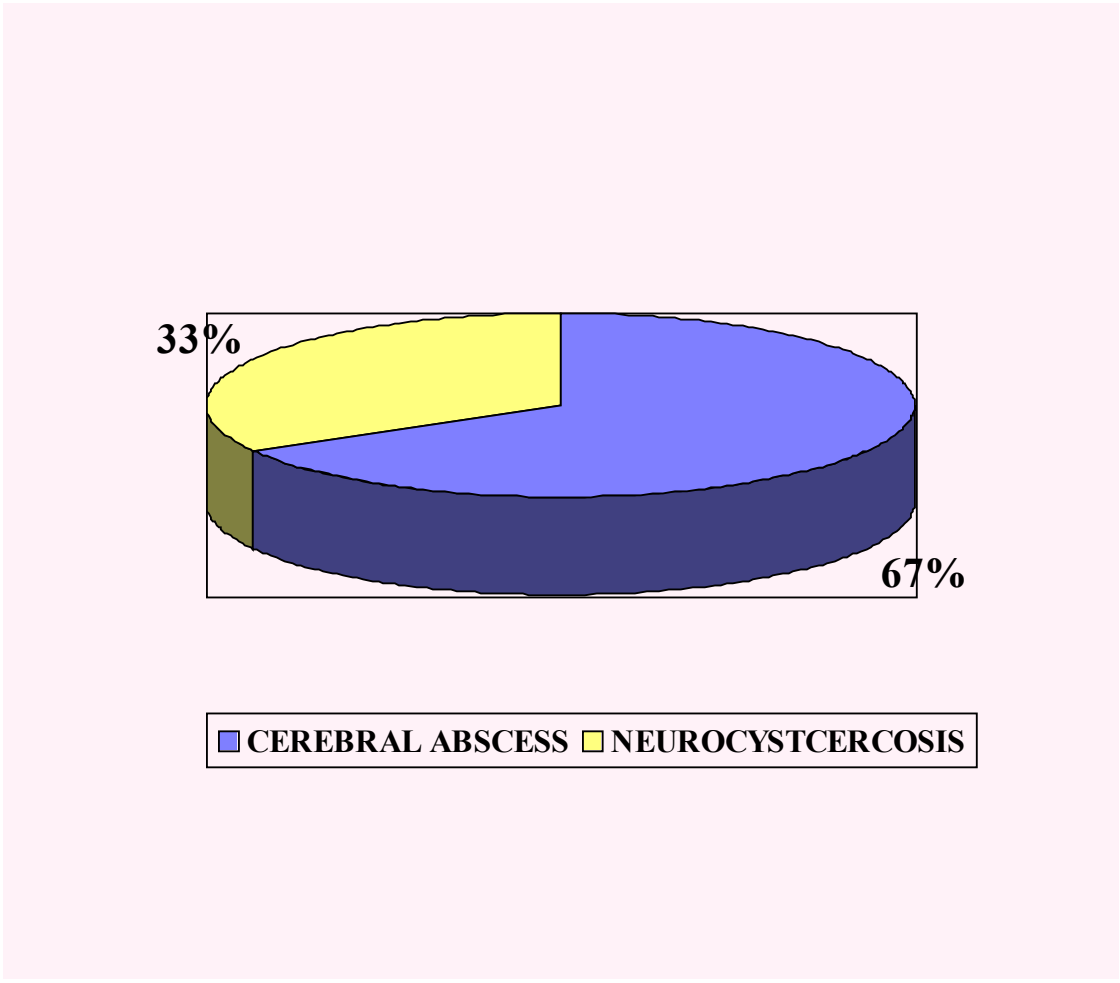
Table : 4

CONGENITAL HEART DISEASE WITH THROMBOEMBOLISM.

(4 CASES)

S. No.	ETIOLOGY	No. OF CASES	PERCENTAGE
1	TETROLOGY OF FALLOT	2	50
2	COMMON AV CANAL DEFECT	1	25
3	VENTRICULAR SEPTAL DEFECT WITH INFECTIVE ENDOCARDITIS	1	25

SPACE OCCUPYING LESIONS- ETIOLOGY



B. HAEMORRHAGIC STROKE : 3 (10.3%)

Table : 5

ETIOLOGY OF HAEMORRHAGIC STROKE

S. No.	ETIOLOGY	No. OF CASES	PERCENTAGE
1	Liver Disease (Biliary Atresia)	1	33.3
2	Mycotic Aneurysm	1	33.3
3	Llate haemorrhagic disease of newborn	1	33.3

Disease of Newborn

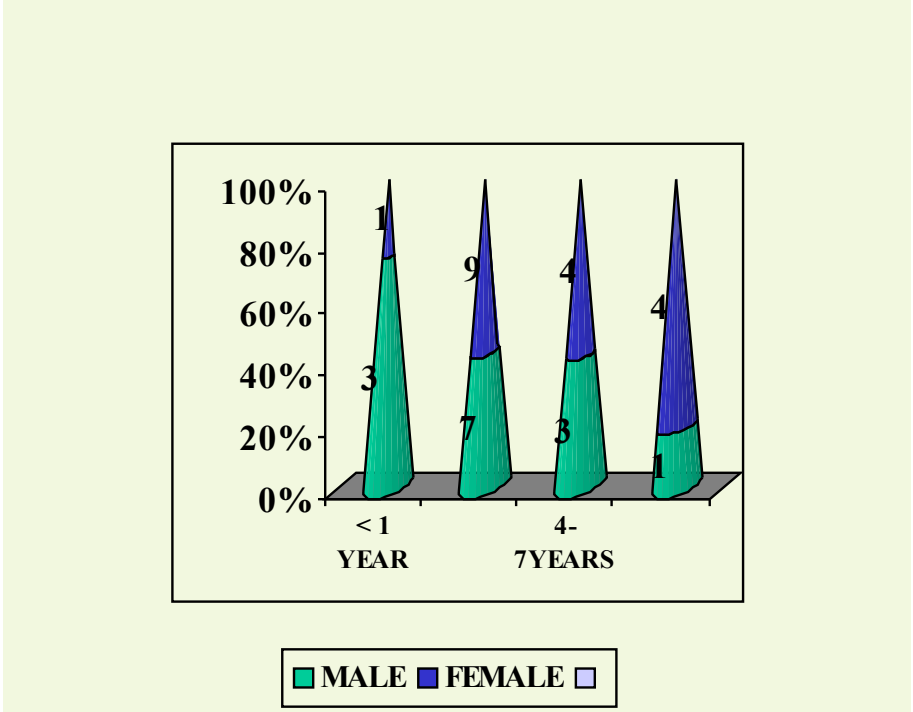
Late Haemorrhagic disease of newborn, liver Disease (Biliary atresia) & mycotic aneurysm each accounted for 1 case.

2. SPACE OCCUPYING LESIONS : 3 (9.4%)

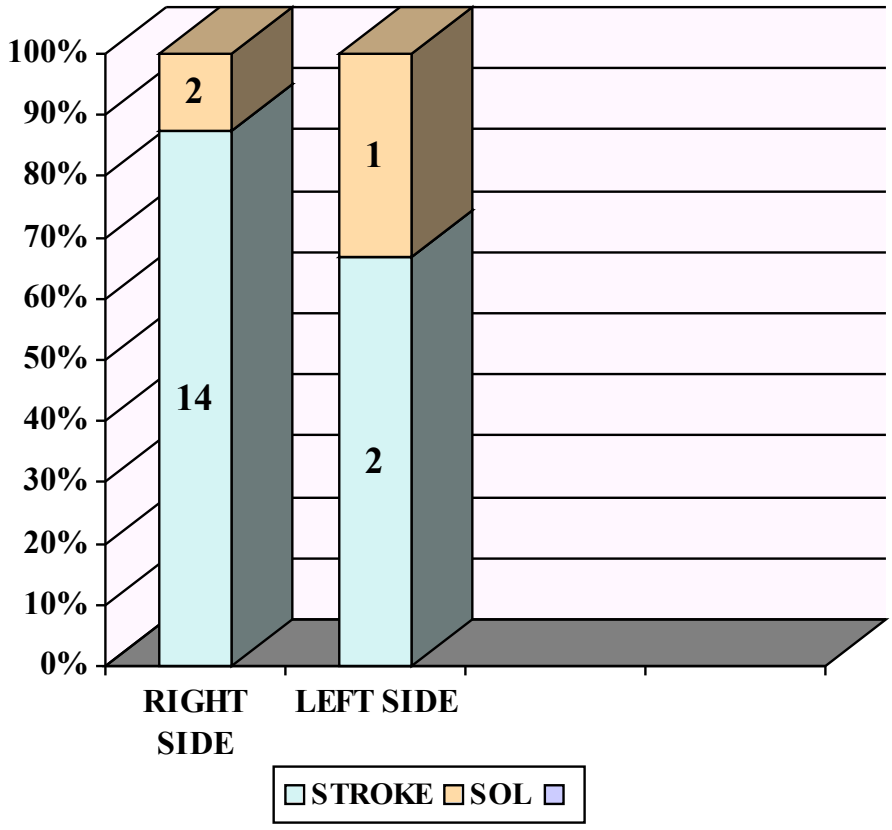
Table : 6 Etiology of space occupying lesions

S. No.	ETIOLOGY	No. OF CASES	PERCENTAGE
1	Cerebral Abscess	2	66.7
2	Neurocysticercosis with convulsions	1	33.3

AGE & SEX DISTRIBUTION OF ACUTE HEMIPLEGIA



SIDE



CLINICAL PROFILE

(i) SEX DISTRIBUTION :

Table : 7

SEX DISTRIBUTION OF ACUTE HEMIPLEGIA

	MALE	FEMALE
NO. OF CASES	14	18
PERCENTAGE	43.8	56.2

Sex Ratio : 0.78 : 1 (M&F)

56.2% of hemiplegic were female and rest were males.

(ii) AGE & SEX DISTRIBUTION

Table : 8 AGE & SEX DISTRIBUTION

AGE	MALE	FEMALE	No.of cases	%
< I Year	3	1	4	12.5
1-3 Years	7	9	16	50.1
4-7 Years	3	4	7	21.9
8-12 Years	1	4	5	15.6

About 50% of the cases were in 1-3 Yrs age group. 4-7 Yrs Age Group accounted for 21.9% ,<1yr 12.5% & 8-12 yrs for above 15.6% cases.

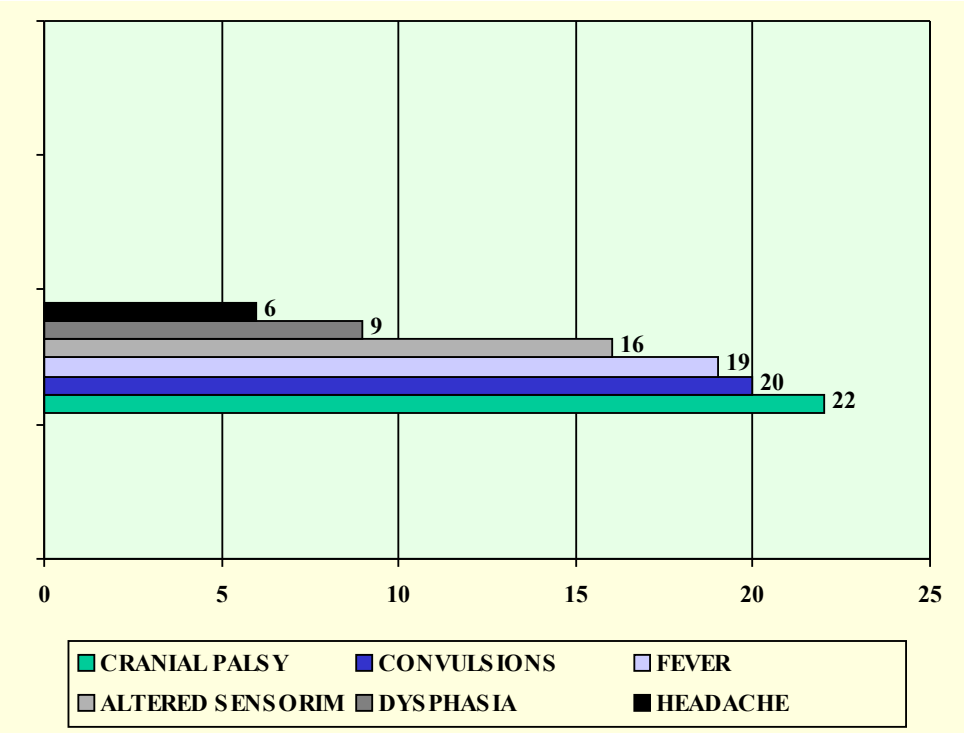
(iii) SIDE

Table : 9 SIDE OF INVOLVEMENT

	Right side	**Left side**
No. of cases	16	16
Percentage	50	50

Right & Left side were equally involved.

CLINICAL PRESENTAION (WITH HEMIPLEGIA)



iv) CLINICAL PRESENTATION [With hemiplegia]

Table No : 10

CLINICAL PRESENTATION

S. No.	PRESENTATION	NO OF CASES	PERCENTAGE
1	CRANIAL NERVE PALSY	22	68.8
2	CONVULSIONS	20	62.5
3	FEVER	19	59.4
4	ALTERED SENSORIUM	16	50
5	DYSPHASIA	9	28.1
6	HEADACHE	6	18.8

Cranial Nerve palsy was the most common clinical presentation found in 68.8% of hemiplegic children. Convulsions in 62.5%, Fever in 59.4%, altered sensorium in 50%, Dysphasia in 28.1% & headache in 18.8% were the other presentations.

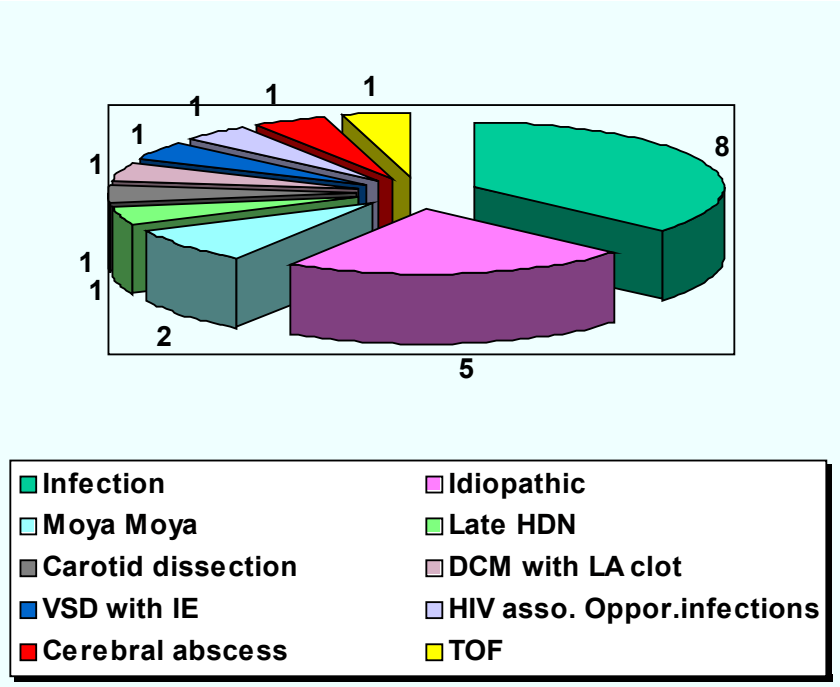
(v) CRANIAL NERVE INVOLVEMENT

Total Number of cases with cranial nerve Involvement : 22 (68.8%)

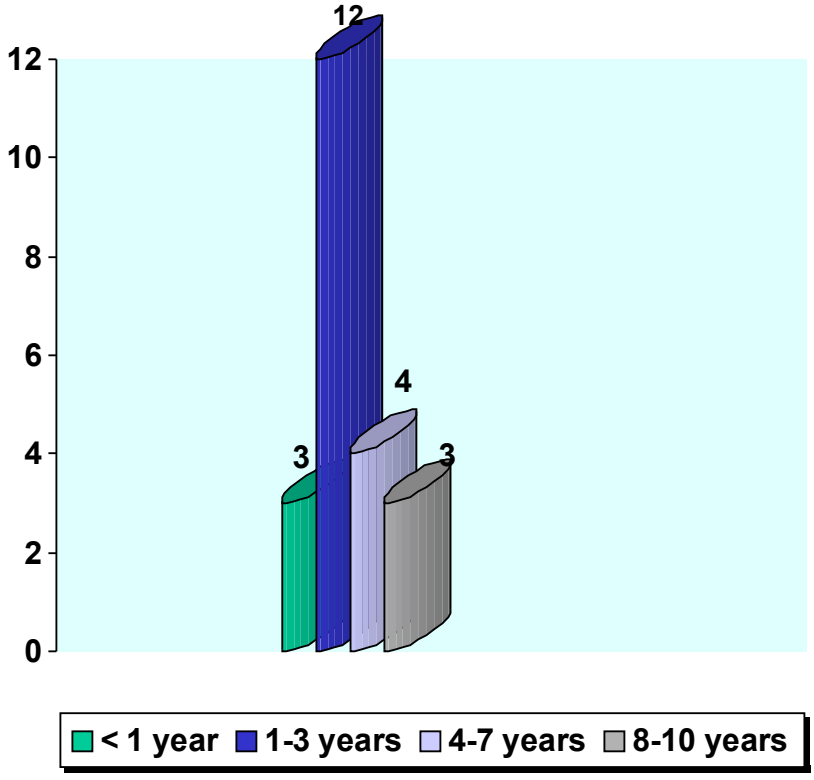
Facial Palsy : 21 (95.5%)

III Nerve Palsy : 1 case (4.5%)

CRANIAL NERVE INVOLVEMENT –ETIOLOGY



AGE DISTRIBUTION



ETIOLOGY

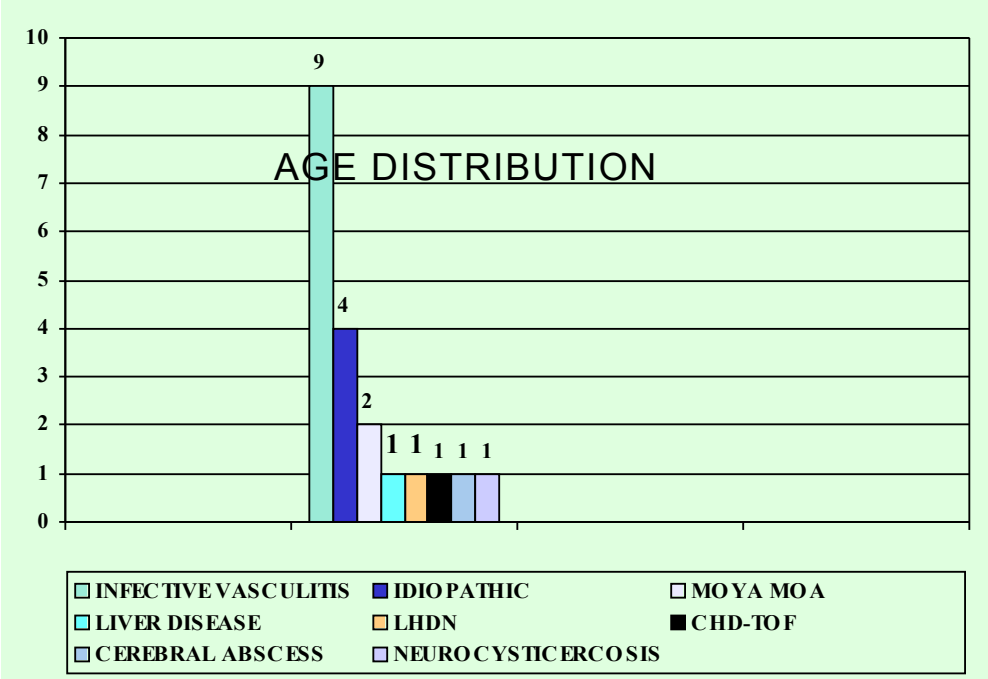
Table : 11

ETIOLOGY OF CRANIAL NERVE INVOLVEMENT

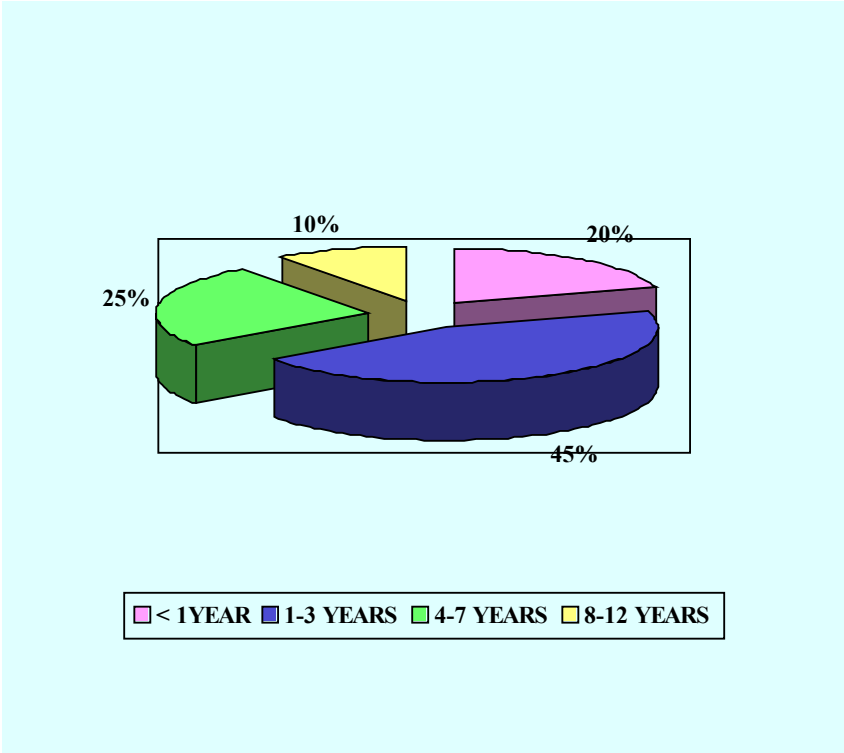
S. No	ETIOLOGY	TOTAL No.	PERCENTAGE
1	INFECTIVE VASCULITIS	8	36.4
2	IDIOPATHIC	5	22.7
3	MOYA MOYA	2	9.1
4	LATE HAEMORRHAGIC DISEASE OF NEWBORN (III Nerve palsy)	1	4.5
5	CAROTID DISSECTION	1	4.5
6	DILATED CARDIOMYOPATHY WITH LEFT ATRIAL CLOT	1	4.5
7	VSD WITH INFECTIVE ENDOCARDITIS	1	4.5
8	HIV ASSOCIATED OPPORTUNISTIC INFECTION	1	4.5
9	CEREBRAL ABSCESS	1	4.5
10	TOF WITH THROMBO EMBOLISM	1	4.5

Infective Vasculitis was the most common (36.4%) cause of cranial nerve involvement.

CONVULSIONS –ETIOLOGY



AGE DISTRIBUTION



<1 : 3 (13.6%)

1-3 : 12 (54.6%)

4-7 : 4 (18.2%)

8-12 : 3 (13.6%)

Cranial nerve involvement was more common in 1-3 years age group.

vi) CONVULSIONS

TOTAL NUMBER OF PATIENTS WITH CONVULSIONS : 20 (62.5%)

ETIOLOGY

Table : 12 ETIOLOGY OF CONVULSIONS

S. No	ETIOLOGY	TOTAL No.	PERCENTAGE
1	INFECTIVE VASCULITIS	9	45
2	IDIOPATHIC	4	20
3	MOYA MOYA	2	10
4	LIVER DISEASE (BILIARY ATRESIA)	1	5
5	LATE HAEMORRHAGIC DISEASE OF NEWBORN	1	5
6	CHD - TOF - THROMBO EMBOLISM	1	5
7	CEREBRAL ABSCESS	1	5
8	NEURO CYSTICERCOSIS WITH CONVULSIONS	1	5

Infective vasculitis was the most commonest cause of convulsions accounting for about 45%. Four out of seven idiopathic cases had convulsions. Both the moya moya cases presented with convulsions.

AGE DISTRIBUTION

<1 year : 4 (20)

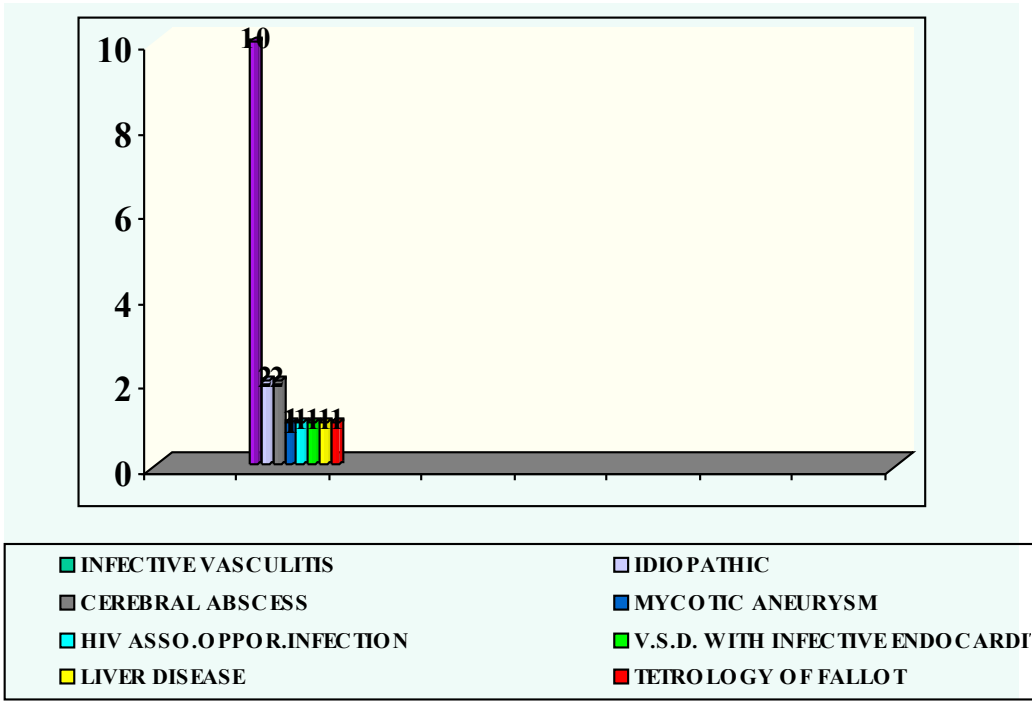
1-3 years : 9 (45%)

4-7 years : 5 (25%)

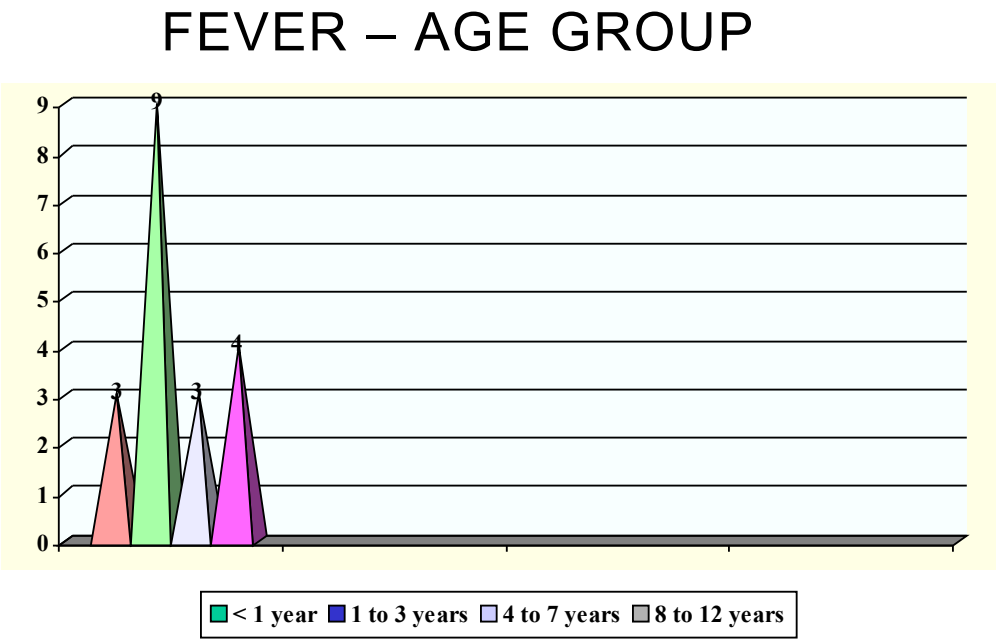
8-12 years : 2 (10%)

Convulsions were more common in 1-3 yrs age group (45%) followed by 4-7 yrs (25%), < 1 yr (20%) and 8-12 yrs (10%). All the cases of moya moya presented with convulsions.

ETIOLOGY OF FEVER



vii) FEVER



Total no. of cases with fever : 19 (59.4%)

ETIOLOGY

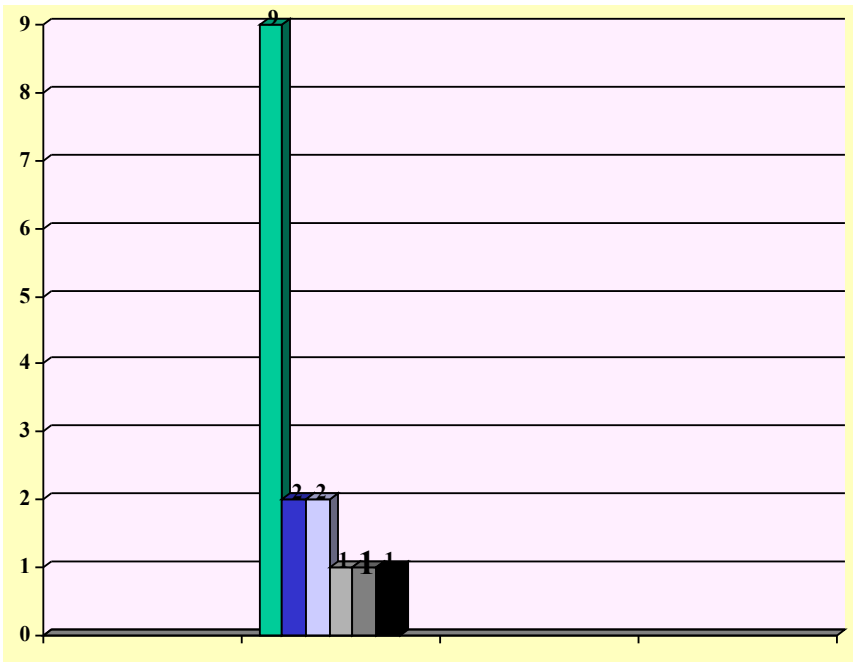
Table : 13 ETIOLOGY OF FEVER

S. No	ETIOLOGY	TOTAL No.	PERCENTAGE
1	Infective vasculitis	10	52.5
2	Idiopathic	2	10.5
3	Cerebral Abscess	2	10.5
4	Mycotic Aneurysm	1	5.3
5	HIV Associated Opportunistic Infection	1	5.3
6	Ventricular septal defect & Infective endocarditis	1	5.3
7	Liver Disease (Biliary Atresia)	1	5.3
8	Tetrology of fallot	1	5.3

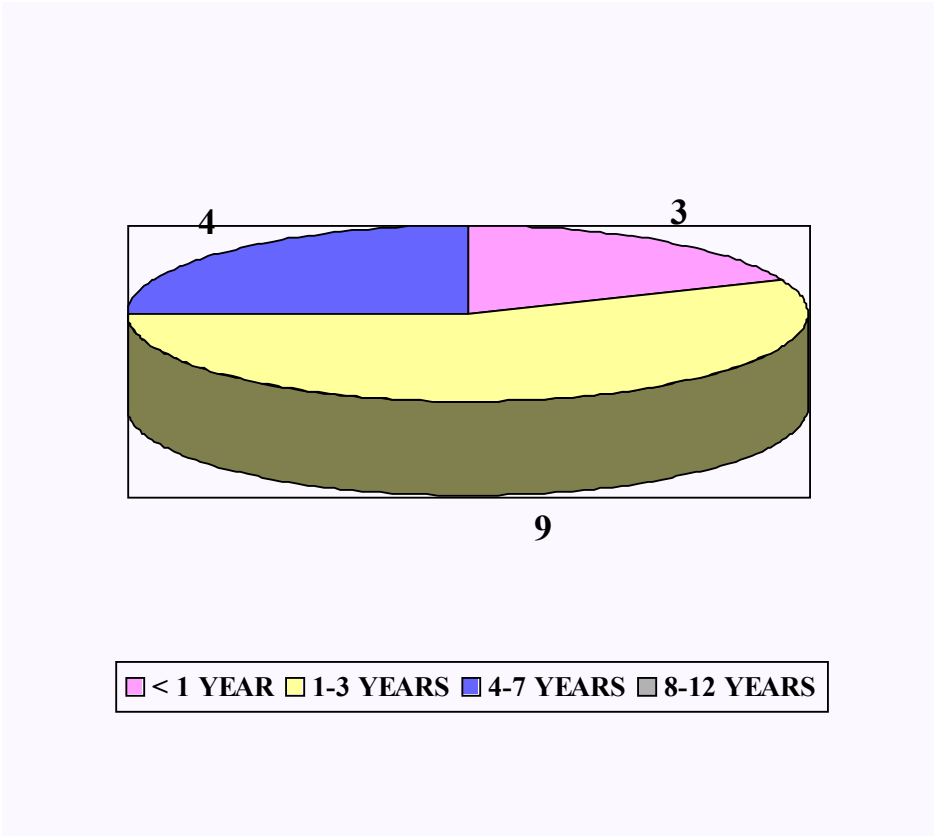
Cases with Infective vasculitis had fever more often (52.5%) than other etiology.

ALTERED SENSORIUM - ETIOLOGY

AGE DISTRIBUTION



AGE DISTRIBUTION



< 1	:	3	(15.8%)
1-3	:	9	(47.4%)
4-7	:	3	(15.8%)
8-12	:	4	(21%)

Fever was present more commonly in 1-3 years age group.

VIII) ALTERED SENSORIUM

Total no. of cases with altered sensorium : 16 (50%)

ETIOLOGY

Table : 14 ETIOLOGY OF ALTERED SENSORIUM

S. No	ETIOLOGY	TOTAL No.	PERCENTAGE
1	Infective vasculitis	9	56.25
2	TOF - THROMBO EMBOLISM	2	12.5
3	Moya Moya	2	12.5
4	Idiopathic	1	6.25
5	Mycotic Aneurysm	1	6.25
6	Liver Disease (Biliary Atresia)	1	6.25

Infective vasculitis was the most common cause of altered sensorium occurred in 56.25% of patients. All the cases of TOF with thromboembolism and Moya Moya presented with altered sensorium.

AGE DISTRIBUTION

< 1 year : 3 (18.75%)

1 - 3 years : 9 (56.25%)

4 - 7 years : 4 (25%)

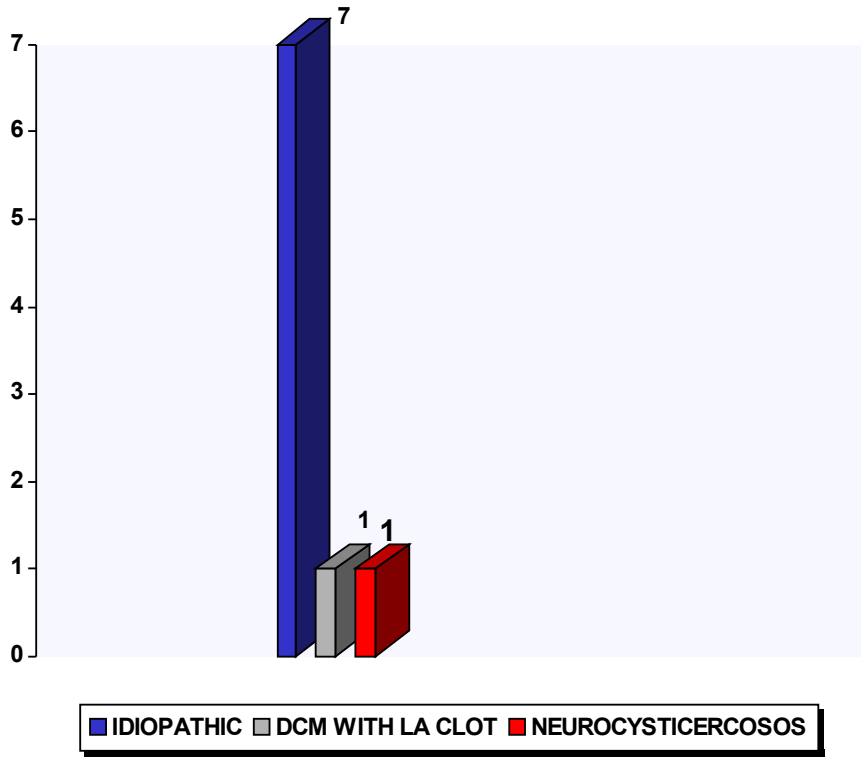
8 - 12 years : 0

Altered sensorium more common in 1-3 years age group (56.25%) ; followed by 4-7 years age group (25.1%)

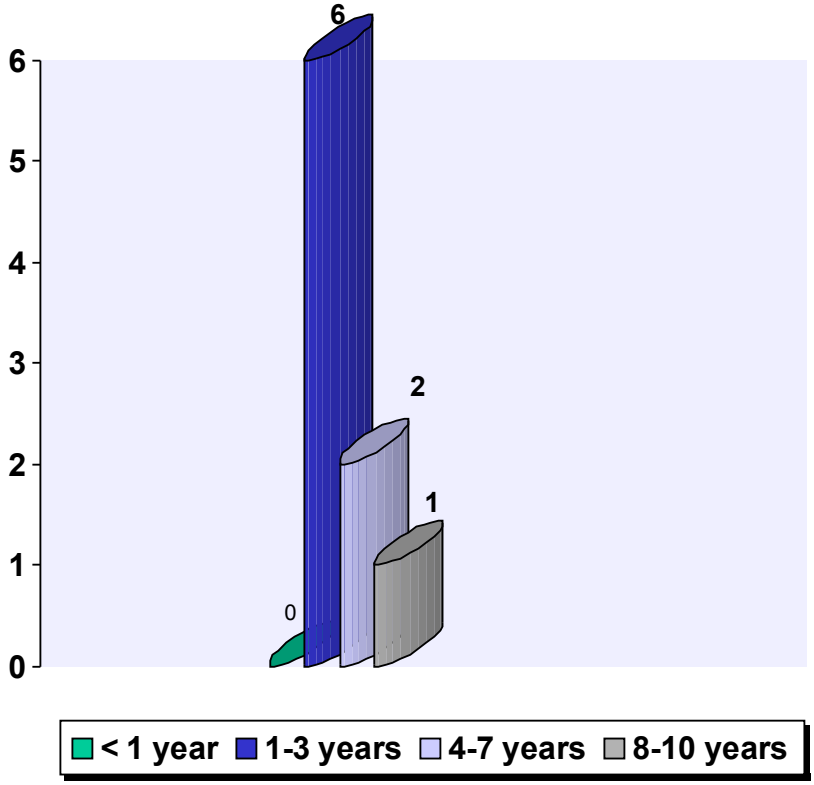
IX DYSPHASIA

Total Number of cases with Dysphasia :9 (28.1%)

DYSPHASIA –ETIOLOGY



AGE DISTRIBUTION



ETIOLOGY

Table : 15 : ETIOLOGY OF DYSPHASIA

S. No	ETIOLOGY	TOTAL No.	PERCENTAGE
1	IDIOPATHIC	7	77.8
2	Dilated cardiomyopathy with left Atrial clot	1	11.1
3	Neurocysticercosis with convulsions	2	12.5
4	Idiopathic	1	6.25

Dysphasia was present most commonly in Idiopathic group (77.8%). But, all Idiopathic group had dysphasia.

AGE DISTRIBUTION

<1 : 0

1-3 : 6 (66.7%)

4-7 : 2 (22.2%)

8-12 : 1 (11.1%)

Dysphasia was most commonly noted in 1-3 years age group (66.7%). But all of them totally recovered.

x) HEADACHE

Total number of cases with headache : 6 (18.75%)

ETIOLOGY

Table 16 : ETIOLOGY OF HEADACHE

S. No	ETIOLOGY	TOTAL No.	PERCENTAGE
1	CEREBRAL ABSCESS	2	33.3
2	MYCOTIC ANEURYSM	1	16.7
3	HIV ASSOCIATED OPPORTUNISTIC INFECTION	1	16.7
4	INFECTIVE VASCULITIS	1	16.7
5	VSD INFECTIVE ENDOCARDITIS	1	16.7

Both cases of cerebral abscess presented with Headache.

AGE DISTRIBUTION

<1 Yr : 0

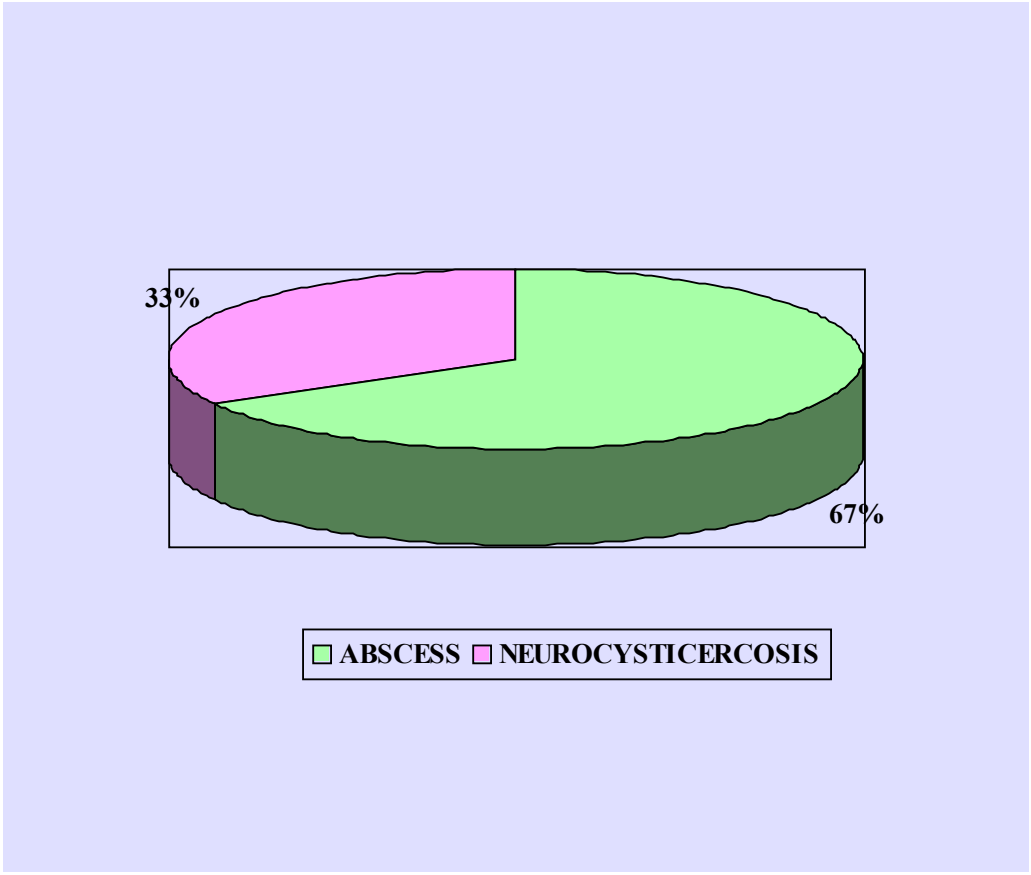
1-3 yr : 0

4-7 : 2 (33.3 %)

8-12 : 4 (66.7%)

Headache was present more in 8-12 yrs age group.

NON VASCULAR ETIOLOGY


33%
67%
ABSCESS
NEUROCYSTICERCOSIS

XI) NEURO IMAGING

Table : 17 Neuro Imaging

	NON VASCULAR FINDINGS	VASCULAR FINDINGS
TOTAL NO OF CASES	3	29
PERCENTAGE	9.4	90.6

Vascular etiology is the most common finding in neuro imaging.

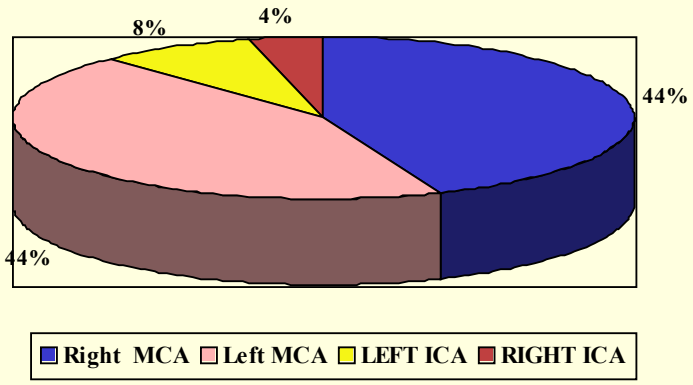
i) Non Vascular findings 3 (9.4%)

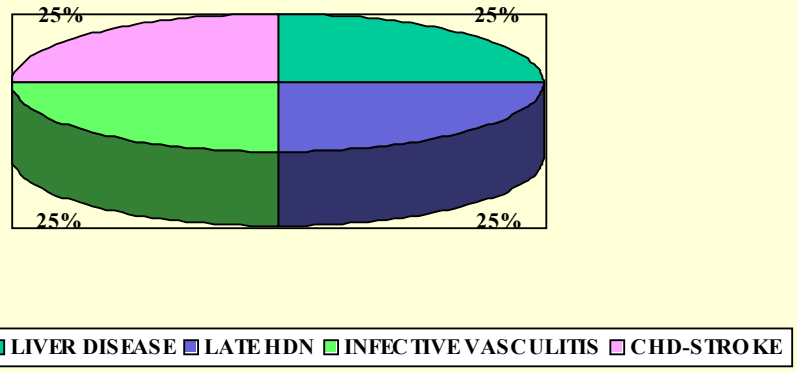
Table : 18 Classification of non vascular Findings

SL.No	ETIOLOGY	NO OF CASES	PERCENTAGE
1	CEREBRAL ABSCESS	2	66.7
2	NEURO CYSTICERCOSIS WITH CONVULSIONS	1	33.3

SINGLE VASCULAR TERRITORY

MULTIPLE VASCULAR TERRITORY - ETIOLOGY





(ii) VASCULAR FINDINGS

Total Number of cases with Vascular Findings 29 (90.6%)

Table 19 VASCULAR TERRITORIES INVOLVED

	MULTIPLE VASCULAR TERRITORIES	SINGLE VASCULAR TERRITORIES
Total Number of cases	4	25
Percentage	13.8	86.2

Acute Hemiplegia can also occur in patients with involvement of multiple vascular territories.

a) MULTIPLE VASCULAR TERRITORY

ETIOLOGY

Total number of cases with involvement of Multiple Vascular Territories / 4 (13.8%)

TABLE NO : 20 ETIOLOGY OF MULTIPLE VASCULAR TERRITORY

SL.No	ETIOLOGY	NO OF CASES	PERCENTAGE
1	LIVER DISEASE (BILIARY ATRESIA)	1	25
2	LATE HAEMORRHAGIC DISEASE OF NEWBORN	1	25
3	INFECTIVE VASCULITIS	1	25
4	COMMON AV CANAL DEFECT.	1	25

(b) SINGLE VASCULAR TERRITORY

Total number of cases with single Vascular territory involvement : 25 (86.2%)

Table No. 21 SINGLE VASCULAR TERRITORY INVOLVEMENT

S.No	VASCULAR TERRITORY INVOLVED	NO OF CASES	PERCENTAGE
1	Right Middle Cerebral Artery	11	44

2	Left Middle Cerebral Artery	11	44
3	Internal Carotid artery Right Left	 1 2	 4 8

Left Middle cerebral artery territory & Right Middle cerebral artery territory were equally involved.

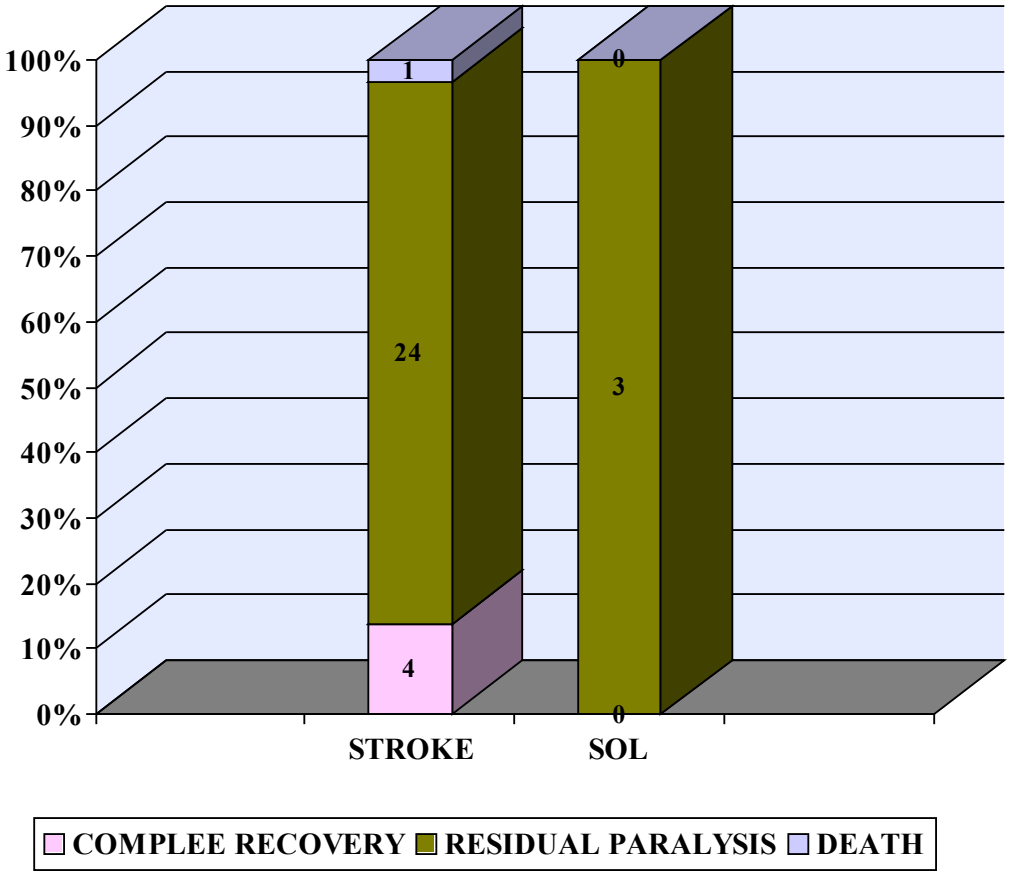
(XII) OUTCOME

TABLE NO : 22 OUTCOME OF ACUTE HEMIPLEGIA IN THIS STUDY

S.No	OUTCOME	NO OF CASES	PERCENTAGE
1	DEATH	1	3.3
2	SURVIVED	31	96.9

The morality in this study was 3.1% (1case). Etiology was massive infarct due infective vasculitis (Pyogenic meningitis).Age of the child was 1 year.

OUTCOME


100%
90%
80%
70%
60%
50%
40%
30%
20%
10%
0%
1
24
4
0
3
0
STROKE
SOL
COMPLEE RECOVERY
RESIDUAL PARALYSIS
DEATH

AFTER 3 MONTHS FOLLOW UP

Table No : 23

Outcome After 3 months Follow up.

S.No	OUTCOME	NO OF CASES	PERCENTAGE
1	Complete recovery	4	12.9
2	Residual paralysis	27	87.1
3	Recurrence	-	-

Complete recovery was present only in 12.9% of patients. There was no recurrence in any of the survivors after 3 months of follow up.

DISCUSSION

This Study included 32 children in the age group of 1 month - 12 yrs.

ETIOLOGICAL PROFILE

The two etiologies found in this study were stroke (90.6%) and space occupying lesion (10.4%) Similar studies done by Gold & CARTER et al 19 revealed that stroke accounted for 87.2% and Trauma accounted for 12.7%.

Similar Study done by Chou YH & Wang, PJ et al at Department of Pediatrics, National Taiwan University Hospital 20 showed that stroke accounted for about 66.7% space occupying lesion 12.3% and trauma 10.5% of cases.

There was no trauma case in this study as the trauma cases were directly sent to trauma ward & Neurosurgery department in this Institution.

STROKE :

In this study ischemic type of stroke is more common (89.7%) than haemorrhagic stroke (10.3%) This result is comparable to a study conducted in University of Hong Kong 25 where the ischemic stroke constituted about 72% and haemorrhagic stroke 25%.

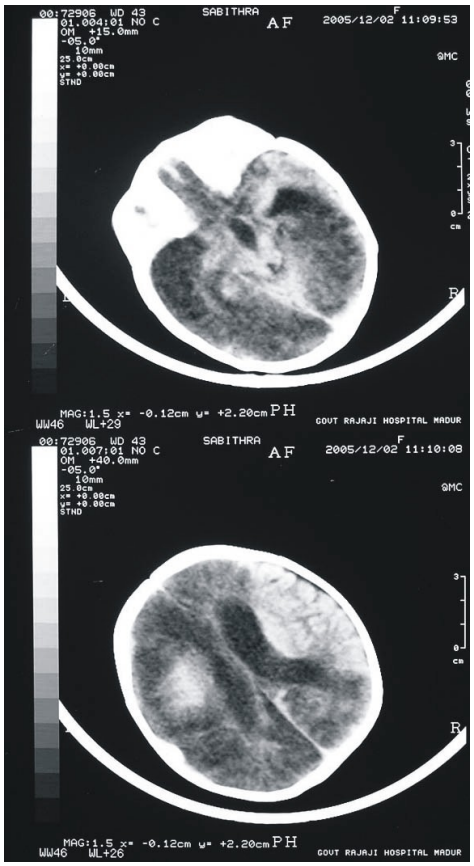


FIGURE - 3
HAEMORRHAGIC STROKE

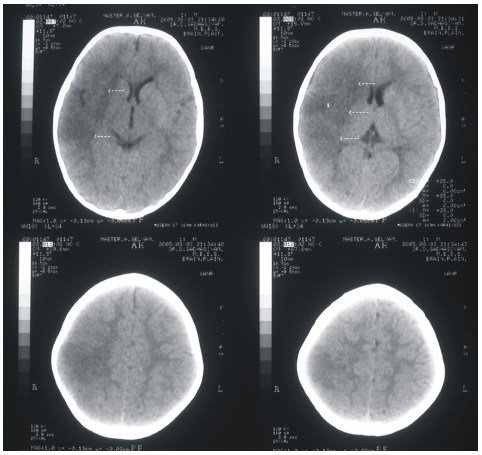


FIGURE - 4
ISCHEMIC STROKE

Similar results were obtained in a study by Gold & Carter19 et al in which ischemic stroke was about 82.5% and haemorrhage stroke was about 17.5%.

Ischemic Stroke

The most common cause of ischemic stroke in this study was infective vasculitis (42.3%); This result is comparable to a retrospective analysis (1991-2000)of 100 stroke cases done in All India Institute of Medical Sciences.

A recent study by Tahir Saeed Siddiqui 31 et al in Ayub Medical College during 2002-2005 showed that neuro infections were the most common cause of stroke (56.09%).

Among the neuro infections, viral meningo encephalitis (54.5%) was the most common cause followed by TB meningitis and pyogenic meningitis (18.2%) in this study. Similarly a study by Tahir Saeed et al also showed viral encephalitis as the most common cause (56.52%)

'Idiopathic Group' was the next most common group (26.9%) in this study. All the published studies have shown the 'Idiopathic group' as one important cause of ischemic Stroke. Gold and Carter et al19 showed that Idiopathic was the most common cause of ischemic stroke. But it was only 12% in Hong Kong University study, 17.07% in a study by Tahir Saeed et al31.

Third most common cause of ischemic stroke is congenital heart disease with thrombo embolism (15.4%) in this study. Among these, cyanotic heart disease accounted for about 75%.

In the HongKong University study 25 congenital Heart Disease accounted for about 30% and in Tahir Saeed's Study31 it was only 9.75%.

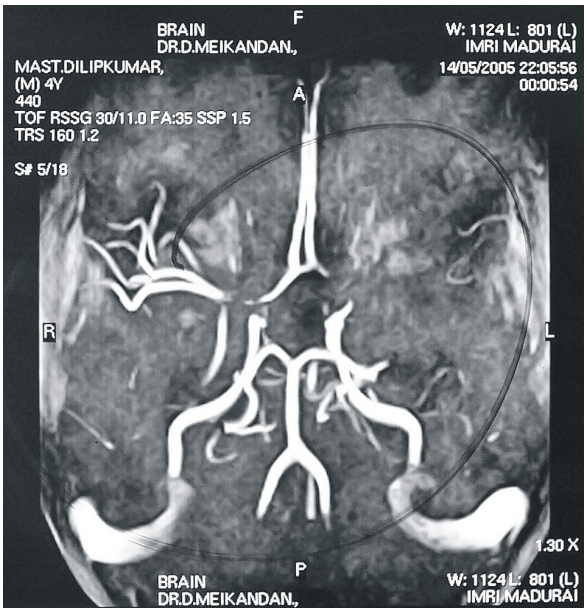
HAEMORRHAGIC STROKE

No cases of vascular Malformations were reported in this study; but most other studies in the literature showed vascular malformation as one important cause of Haemorrhagic stroke.

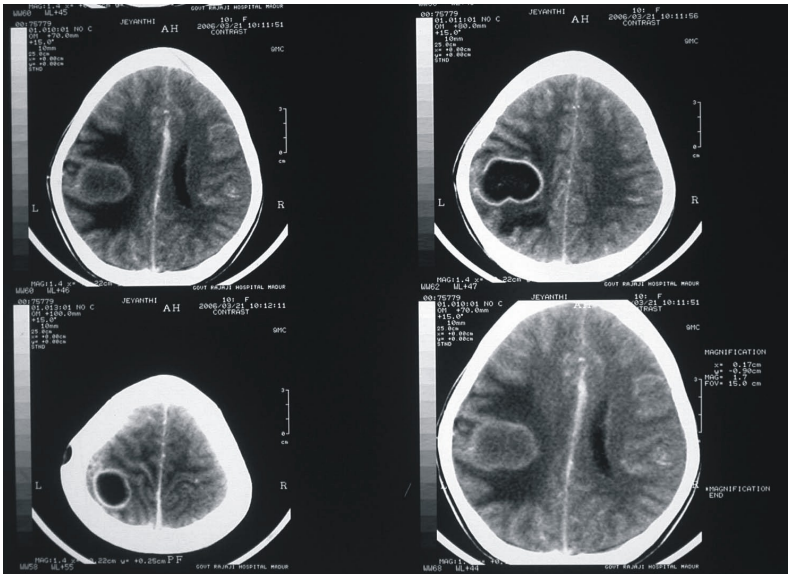
In our study liver disease due to biliary atresia, late haemorrhagic disease of newborn & mycotic aneurysm rupture each accounted for one case.

Space occupying Lesion :

Two cases of cerebral abscess due to TOF and one case of neurocysticercosis with convulsions caused hemiplegia in this study. Even though literatures are showing that these two etiologies can cause acute hemiplegia, published data are few.



F I G U R E - 5
M O Y A M O Y A



F I G U R E - 6
S P A C E O C C U P Y I N G L E S I O N
- C E R E B R A L A B S C E S S

CLINICAL PROFILE

AGE & SEX DISTRIBUTION

This study included 32 children in the age group of 1 month - 12 yrs of age, with the sex ratio of 0.78:1 (M:F) similar to Tahir Saeed et al (0.86:1). But in Hong Kong study25 it was 1.27:1

1-3 yrs age group was the most commonly involved (50%) group in this study which is similar Tahir Saeed et al (58.53%). Next most common group was 4-7 yrs (21.9%) The age group involved mostly in this study is corresponding to the most common age group of acute infantile hemiplegia as per Literature.

SIDE

Right & left sides are equally involved (1:1) in this study. But Fritsch.G et al showed 2.6:1 (R:L)

CLINICAL PRESENTATION :

Cranial nerve palsy was the most common presentation in this study. It was present in 65.6% of cases in this study which is comparable to other studies like Taiwan University hospital study20 (47.4%) & Fritsch et al (63.1%)

In this study facial palsy was more common than other cranial Nerve Palsy which is comparable to the above mentioned studies.

Infective vasculitis was the most common etiology for facial palsy & 1-3 yrs age group was the most common age group involved in this study.

Convulsions were present in 62.5% of cases of acute hemiplegia in this study which is lesser than Taiwan University hospital study 20 (21.1%) & Fritsch et al (31.6%)

Most common age group presented with convulsions was 1-3 yrs (45%) followed by 4-7yrs age group (25%). Unlike adults, convulsions are more common in young children with acute hemiplegia in this study as per literature. Among the 62.5% of patients with convulsions, infective vasculitis was the most common cause of convulsions (45%) which was also the most common cause of stroke in this study.

Three other important observations in this study are,

(i) About 81.1% Patients of infective vasculitis presented with convulsions.

(ii) About 57.1% Patients of Idiopathic group presented with convulsions

(iii) All the cases of Moya Moya (100%) presented with convulsions.

Fever was present in 54% of patients with acute Hemiplegia in this study. The most common etiology was infective vasculitis (54.1%) and rest of the etiologies were also infection related except the idiopathic group (10.5%) and Liver disease (5.3%). The most common age group presented with fever was 1-3yrs. In Taiwan university hospital study20 fever was present in 21.1% of cases of acute hemiplegia.

About 50% of patients with acute Hemiplegia presented with altered sensorium and the most common etiology was infective vasculitis (56.25%). Here also 81.8% of infective vasculitis cases and all the cases of 100% moya moya presented with altered sensorium. Altered sensorium was the second most common presentation in both Taiwan University hospital study20 (42.1%) and study by Fritsch et al29 (57.9%)

About 28.1% of Patients with acute hemiplegia presented with dysphasia and the most common etiology was Idiopathic (77.8%). The most common age group involved was 1-3 yrs (66.7%) All the Idiopathic cases (100%) presented with dysphasia. Dysphasia was present in 31.6% patients of acute hemiplegia in the study by Fritsch.G et al.

About 18.75% of patients with acute hemiplegia presented with headache in this study. 8-12 yrs age group most commonly presented with

headache. In Taiwan University hospital study20 it was about 42.1%. The reasons for this variation between the two study is the age group involved and the etiology. In Taiwan hospital study, they included children upto 18yrs but in this study only children up 12 years were included because only children up to 12 years are admitted in pediatric ward in our institution. Number of cases with space occupying lesions are more in Taiwan study than this study.

Regarding the neuro imaging, clinical Presentation correlated well with neuro imaging. Non vascular findings in 9.4% of cases & stroke in 90.6% of the cases.

Multiple vascular territorries are involved in 4 cases (13.8%) of the stroke patients. Among these 4 patients two had haemorrhagic stroke & 2 had ischemic stroke the two hemorrhagic stroke are due to acquired coagulation defects. One ischemic stroke is due to HIV associated opportunistic infections another one due to common AV canal defect with multiple emboli.

About 86.2% stroke patients had single vascular territory involvement. Among the above cases

Right Middle cerebral artery (44%) and Left middle cerebral artery (44%) territories were equally involved . 12% cases were due to Internal carotid artery infarct.

In Hong Kong University study25 middle cerebral artery territory was involved in 30.6% of ischemic stroke patients. Anterior cerebral Artery in 5.6%

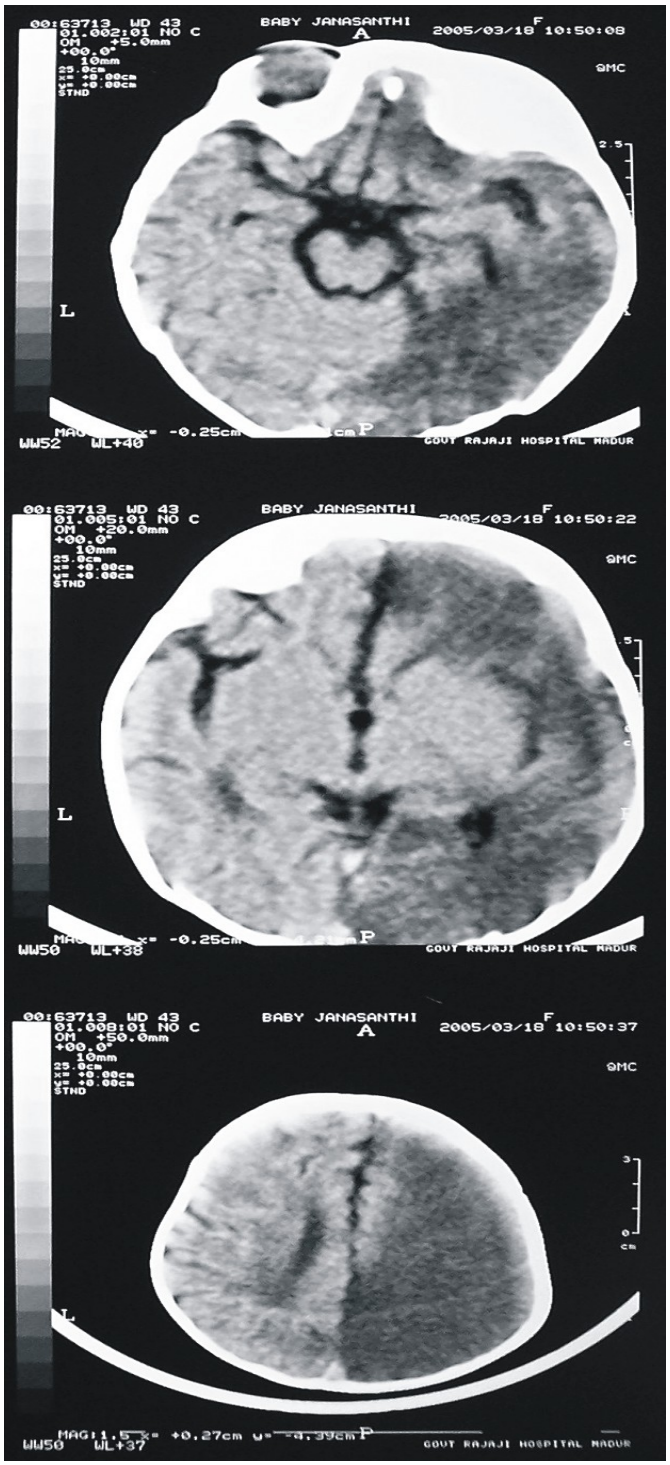


FIGURE - 7

MASSIVE INFARCT DUE TO
INFECTIVE VASCULITIS (PATIENT DIED)

& there was multiple vascular territory involvement in 41.7% of ischemic stroke patients. Haemorrhagic stroke was present in 28% of cases.

Outcome :

Mortality due to acute Hemiplegia in this study was 3.1% (1 case) that case died due to massive infarct due to Infective vasculitis (pyogenic meningitis).Age of the child was 1 year.

But in Taiwan University hospital study20 mortality was 21%. In Hong Kong University study25 there was 18% mortality rate among stroke patients.

In this study complete recovery was present in 12.9% of cases & Residual paralysis was present in 87.1% of cases & there was no recurrence in the 3 months follow-up.

In Hong Kong University Study25 residual paralysis was present in 41% of survivors & recurrence was noted in 10% of survivors.

As our institution is a tertiary care hospital , most of the cases were from the near by districts of Madurai and they got their drugs and follow up from their district head quarters hospital.So the follow up period of our study was only 3 months.

CONCLUSION

(i) STROKE was the most common etiology (90.6%) of acute hemiplegia in children in the age group of 1 month - 12yrs.

(ii) Ischemic stroke was more common (89.7%) than haemorrhagic stroke (10.3%)

(iii) Among the ischemic Strokes, infective vasculitis was the most common (42.3%) cause which has to be identified & treated earlier.

(iv) Among the congenital heart disease, cyanotic heart disease was more commonly (75%) associated with stroke than acyanotic heart disease.

(v) Apart from trauma, tumors , vascular malformations and acquired coagulation abnormalities can also cause haemorrhagic stroke particularly in infants.

(vi) Sex ratio of acute hemiplegia was 0.78 : 1(M:F) and the most common age group involved was 1-3yrs.

(vii) Unlike adults, cranial nerve palsy (65.6%), convulsions (62.5%) ,fever (59.4%) and altered sensorium (50%) were the most common presentation of acute hemiplegia in children.

(viii) In the neuroimaging non vascular findings like abscess & neurocysticercosis were found in 9.4% of cases. Among patients with stroke, 13.8% cases had multiple vascular territory involvement and 86.2% cases had single vascular territory involvement. Both right middle cerebral artery territory

and left middle cerebral artery territory (44%) are equally involved. Internal carotid artery territory involved in 12% cases.

(ix) Mortality rate in this study was 3.1%. 12.9% of survivors recovered completely & there was no recurrence in 3 months follow-up.

LIMITATIONS OF THE STUDY

(i) Adolescents were not included in this study

(ii) Trauma cases were also not included in this study.

(iii) In the idiopathic cases, even though neuro imaging like CT/MRI/MRA, preliminary laboratory studies, coagulation and metabolic studies were done, Protein C/S, antithrombin - III & factor V Leiden estimation, aminoacid estimation, serum & CSF Lactate / Pyruvate estimation & methyl tetrahydro folate reductase gene were not done due to lack of facilities.

iv) The follow up period is not adequate

RECOMMENDATIONS

(i) As strokes can be prevented in some children & treated in others ,the correct etiology should be identified.

(ii) Access to health care facilities should increase as this may reduce the role of infections diseases which is the most common cause of stroke in developing countries like INDIA.

(iii) Patients with chances for recurrence should be followed up regularly with adequate and appropriate prophylaxis.

iv) Screening for metabolic and coagulation disorders should be done when ever necessary.

(v) All the investigations for the complete work up of Acute Hemiplegia in children should available at least in the tertiary care hospitals.

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CASE PROFORMA

ETIOLOGICAL PROFILE OF ACUTE HEMIPLEGIA IN CHILDREN

Name : Address :

Age/Sex :

IP/OP No :

Unit :

HISTORY

H/O Limb Weakness	YES	NO	
Side	Rt.	Lt.	
Limbs	UL.	LL.	BOTH
Onset :	Sudden	Insidious	
Duration:	<24 hrs	>24 hrs	

H/O recurrence	YES	NO
H/O Deviation of angle of mouth	YES	NO
If yes, side	Rt.	Lt.
H/O Seizures	YES	NO
H/O syncope	YES	NO
H/O Involuntary micturition/defecation	YES	NO
	YES	NO

H/O Blindness		
H/O Altered gait	YES	NO
H/O Altered sensorium	YES	NO
H/O refusal of feeds	YES	NO
H/O Headache	YES	NO
H/O Vomiting	YES	NO
H/O Fever	YES	NO
H/OViral exanthemata	YES	NO
H/O Head and neck injury	YES	NO
H/O recent immunization	YES	NO
H/O Loose stools	YES	NO
H/O ear discharge	YES	NO
H/O HT/DM	YES	NO
H/O Mental retardation	YES	NO
H/O Drug intake	YES	NO
H/O DVT	YES	NO
H/O Heart disease	YES	NO
History S/O Blood Dyscrasia	YES	NO
History S/O Nephrotic Syndrome	YES	NO
H/O Chronic tonsillitis	YES	NO
H/O Developmental delay	YES	NO
	YES	NO

H/O Early hand preference

H/O Paucity of movements on one side	YES	NO
H/O Similar illness in family	YES	NO

GENERAL EXAMINATION

Consciousness	Anthropometry
Orientation,	CC
Pallor	HC
Cyanosis	Ht.
Clubbing	Wt.
Temperature	
Gen. Lymphadenopathy	
Neurocutaneous markers	
Facial dysmorphism	
Fontenels	

Vital sings :PR RR BP

EXAMINATION OF CENTRAL NERVOUS SYSTEM

HIGHER FUNCTIONS	Consciousness
	Orientation
	Memory

Language

CRANIAL NERVES

MOTOR SYSTEM

Posture

Bulk

Tone → UL
→ LL

Power
- Wrist
- UL → Elbow
- Shoulder
- Hip
- LL → Knee
- Ankle

Reflexes

Superficial

DTR
- Supinator
- UL → Biceps
- Triceps
- Ankle jerk
- LL

Knee jerk

PLANTER

Sensory System – Pain

Touch

Temperature

Pressure

Vibration

Coordination

Gait

Involuntary Movements

Meningeal signs

Spine & Cranium

CVS

RS

ABDOMEN

INVESTIGATIONS

BLOOD

Peripheral smear/ Complete Hemogram

ESR / Haematocrit/CRP

CT/PT

PT/APTT

Protein C/ Protein S

Lupus anticoagulant

Anti cardiolipin antibodies

Blood and CSF – Lactate / Pyruvate

Blood Sugar / Calcium

Plasma Lipid Profile

ANA

Electrophoresis

Non Enteric Culture

Mantoux test

URINE

- Albumin
- Deposit
- Sugar
- Aminoacidogram

IMAGING

- CT

MRI

X-Ray chest PA view / Skull lateral view

ECG

ECHO

USG Abdomen

Neuro Sonogram

Carotid Doppler

ETIOLOGY

OUTCOME